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NYASALAND PROTECTORATE

Annual Report

of the

Department of Agriculture

1934

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Appendices

A. Locust Report.

B. Report on Zomba and Lilongwe Experimental Stations.

C. Notes on Experimental Work at Port Herald.

D. Mycologist's Report.

E. Notes on Plant Introductions.

F. Agricultural Statistics.

G. Native Tobacco Board Statement of Receipts and Payments, 1934.

Report of the Director of Agriculture

PART I.—Agriculture in Nyasaland

General

Weather Conditions—In Nyasaland the wet season extends from November to April and the remaining six months of the year are dry months. A reference to the table of meteorological records given below will show how well-marked the wet and dry seasons are, and it may be added that the most striking aspect of the weather during the growing season in the majority of districts is the similarity of rainfall totals and temperature figures in a given year to the averages for a number of years.

In the 1933-34 season under review, the usual break between the early rains and the main rains of January-February took place. It was accentuated in the Cholo area, in part of Mlanje and in the Lower River, but, as far as the tea belts were concerned, the period of drought was counterbalanced by the later rainfall of both the rainy season and the dry months. In more southerly districts, the drought of January had an adverse effect on planting and crop growth.

In central and northern areas, the earlier part of the season was suitable for growth, and tobacco in particular made good progress and was free from disease by the end of January. In Dedza and other northern districts, however, adverse conditions accompanied by more rain than the normal amount occurred in February. Food crops were not affected, but tobacco did not make good growth and the weather conditions of this period were responsible for the lowered quality of the crop. In areas where bright tobacco is produced the season was good on the whole, and good ripening weather during March and April led to very fair crops.

Cotton-growing areas had a good season and some very good yields were obtained in the Chikwawa-Munga area, in the Bwanje valley, at Salima and near Palombe.

During the agricultural survey of 1933, the Assistant Director of Agriculture divided central Nyasaland into zones for the purpose of collecting rainfall and other records for analysis and statistical examination. The value of such studies is to be seen in the recognition in South Africa of thirty two rainfall districts which have been studied with regard to the possibilities of weather cycles, the shifts of high-pressure belts and the effect of secular variations on natural vegetation. It will be a long time before extensive studies of this nature can be completed in Nyasaland, but the division into zones will facilitate the compilation of records and assist those responsible for economic progress.

Records are received from officers of the district administration, estate owners and managers, missionaries and others, and thanks are due to all concerned. Weather telegrams are sent every week day to the Chief Meteorologist in Salisbury, and weather forecasts are received from him during the growing season.

The following table gives the rainfall figures for the six-monthly wet and dry periods as they apply to a few stations in each meteorological zone. At most stations the similarity between the 1933-34 figures and the normal is well seen.

		Season 1933-34			
	Zone	Total rainfall November 1,1933 to April 30, 1934 Inches	Normal six wet months Inches	Total rainfall May 1 to October 31, 1934 Inches	Normal for six dry month Inches
Port Herald	A	25.85	29.1	3.92	3.6
Port Herald Experimental Station		28.58	28.8	4.01	3.2
Chikwawa		22.98	29.7	2.51	2.3
Cholo	B	41.57	48.8	10.09	8.1
Makwasa		44.15	46.8	8.55	4.4
Nsikisi		38.22	42.4	9.74	7.8
Mlanje	C	54.35	66.6	14.63	14.5
Chitakali		67.27	65.5	21.22	12.1
Thornwood		58.56	67.8	12.68	11.6
Ruo		48.44	53.7	9.77	6.3
Glenorchy		65.56	56.2	16.73	10.1
Lujeri		72.42	76.3	18.67	14.3
Nalipiri	D	52.46	51.9	13.24	11.0
Blantyre	E	45.26	39.9	4.71	3.3
Chingaluwe		33.74	42.8	5.51	3.3

	Zone	Total rainfall November, 1,1933 to April 30, 1934 Inches	Season 1933-34 Nomal six wet month Inches	Total rainfall May 1 to October 31, 1934 Inches	Normal for six dry month Inches
Michiru	F	35.06	35.3	1.98	2.0
Namalanga	G	27.02	29.9	2.80	1.0
Nasonia		37.39	36.9	2.80	1.9
Zomba Experimental Station	H	43.28	46.8	4.39	4.6
Domasi		46.83	52.7	—	—
Mbidi	I	37.83	35.8	—	—
Liwonde	L	30.02	31.7	2.91	1.1
Namwera	M	35.30	42.2	2.55	.3
Chipunga		38.38	35.0	1.36	.8
Fort Johnston	N	30.12	29.4	.86	1.2
Golomoti		36.84	29.5	.87	.1
Ncheu	P	42.40	37.0	1.71	.9
Likuni	S	36.78	32.9	2.22	1.5
Lilongwe		34.77	32.7	1.19	.8
Dowa	T	40.68	33.1	1.18	.7
Fort Manning		40.56	39.8	1.21	2.5
Dedza	V	43.91	39.7	3.27	2.2
Mzimba	X	28.68	31.7	2.14	.2
Kasungu		38.97	29.1	.31	.3
Kota Kota	Y	63.47	48.2	6.58	2.0
Chinteche	Z	63.00	62.9	27.21	5.1
Karonga		50.52	52.3	4.97	2.8

Production and Export—The customary table showing European production and acreages of the principal crops over the last three years is given here.

	1932 Acres	1932 Yields	1933 Acres	1933 Yields	1934 Acres	1934 Yields
Tea	12,596	2,699,984 lb.	13,830	3,049,760 lb.	15,414	4,449,312 lb.
Coffee	1,449	767 cwt.	1,210	1,128 cwt.	1,188	1,039 cwt.
Tobacco	14,314	6,252,288 lb.	7,862	3,488,016 lb.	8,350	3,895,136 lb.
Sisal	9,785	25 tons	—	—	—	—
Cotton (lint)	265	341 cwt.	246	682 cwt.	1,501	2,451 cwt.
Rubber	1,500	—	1,500	—	1,300	—

Similarly, the numbers of growers and amounts sold of the principal native economic crops for the past three years are as follows.

	1932 No. of growers	1932 Amount sold	1933 No. of growers	1933 Amount sold	1934 No. of growers	1934 Amount sold
Cotton (seed cotton)	13,260	2,698 tons	26,242	3,080 tons	28,970	5,377 tons
Tobacco	53,044	5,904 tons	56,026	4,077 tons	60,247	5,054 tons

The following table, the figures of which have been taken from the customs returns, gives the amounts and values of agricultural produce and raw materials exported during the years 1932, 1933 and 1934.

	1932 Amount	1932 Value £	1933 Amount	1933 Value £	1934 Amount	1934 Value £
Capsicums and chillies	239 lb.	3	16,633 lb.	208	41,398 lb.	517
Coffee	789 cwt.	1,840	357 cwt.	833	366 cwt.	688
Maize and maize flour	5,400 lb.	9	39,454 lb.	44	300,000 lb.	335
Potatoes	97,136 lb.	511	125,397 lb.	671	98,858 lb.	451
Tobacco	15,082,035 lb.	565,576	10,394,498 lb.	389,794	12,544,126 lb.	470,405
Tea	2,573,871 lb.	42,898	3,276,477 lb.	59,656	4,624,111 lb.	171,470
Beeswax	170 cwt.	953	240 cwt.	1,348	197 cwt.	1,104
Cotton (lint)	935 tons	34,916	1,082 tons	50,014	1,851 tons	102,876
Cotton seed	1,138 tons	2,276	616 tons	1,232	3 tons	6
Fibre (all kinds)	940 lb.	3	20 tons	162	435 lb.	2
Groundnuts	—	—	253 tons	1,519	214 tons	1,068
Rubber	—	—	71,955 lb.	300	22,041 lb.	92
Strophanthus	7,601 lb.	1,140	17,521 lb.	2,628	9,610 lb.	1,441
Rice	6,201 lb.	28	2,438 lb.	11	3,106 lb.	14
Sesame seed	—	—	7,184 lb.	30	—	—

The single bright item in 1933, a year of depressed markets, was tea, the prices of which were showing the good effects of the international scheme of restriction of output during the second half of the year, and it is a particular pleasure to be able to record that 1934 was marked by improved prices for raw cotton and the continuance of tea prices at a profitable, if lower, level. The effect on the tea and cotton industries of these conditions is seen in the increased exports of these two commodities. Tobacco prices call for no special comment beyond the remark that the grower deserves a better return for his labour and that, as will be seen under a later heading, efforts are being made to improve the position of the European flue-cured grower in particular and the growers of all kinds of leaf in general. It is true that tobacco exports increased in 1934, but, as the largest part in the increase was taken by dark leaf, the increase is not necessarily a good thing.

Increases of amounts exported are recorded also in the cases of chillies and maize. It is hoped that a profitable market has been found for maize and that its exports will increase. Rice and coffee exports also increased, but the total amounts of these products are insignificant. On the other hand, the rubber and sisal industries remained moribund, cotton seed prices prohibited export, and efforts to increase production and sale of oil-seeds for export had disappointing results. It is evident that a system of marketing, such as holds in the case of tobacco in the Northern Province, is required for the disposal of other native produce. Two experimental lots of pearl millet were exported, but, in spite of good quality, neither has been followed by a repeat order, while the results of two small shipments of dried cassava root are awaited with interest.

On the whole, the year 1934 was an improvement on 1933, but, while efforts have been made in the country to extend production and cheapen the cost of export and will continue to be made, Nyasaland, like many other countries, would welcome a rise of prices in certain directions.

Locusts.—Although most of the Protectorate was infested with hopper bands, the offspring of the flying swarms which developed in 1933, the prolonged rainy season provided conditions under which considerable natural destruction was affected by the fungus disease (*Empusa grylli*) and the movement of the hopper bands was much reduced. Consequent upon these conditions and the continued campaign of garden protection, for the second year in succession surprisingly little damage was done to native food crops on the whole. The crop protection campaign was largely in the hands of the Native Authorities under the provisions of the Native Authorities Ordinance and in several cases good work was done by them, but, as was only to be expected, there was considerable variation in the energy shewn and the degree of protection obtained. Mr. G. D. Hayes in the Upper Shire, South Nyasa and Ncheu districts and Mr. J. W. Pryor in the Dedza, Lilongwe, Dowa and Fort Manning districts were employed as temporary locust officers until the end of May and their good work should be acknowledged.

Flying swarms remained in the Protectorate during the winter and unfortunately did a certain amount of damage to the first plantings of maize and cotton in October, November and December both before and after egg-laying took place, while, by the end of December, hoppers had hatched out in scattered areas in all districts. Fuller details will be found in appendix A which is a report by the Entomologist on various aspects of the locust position during 1934.

Board of Agriculture.—The board met twice during 1934. The most important matter on which it was called upon to advise Government was the water-supply operations of the Director of Geological Survey for the year 1935 and for a further five-year period after 1935. The board recommended a priority list of districts for attention during 1935 and supported the case for a further grant from the Colonial Development Fund to enable water supply work to be continued for another period of years. Other matters before the board were the formation of a Coffee Growers' Section of the British Empire Producers' Organisation, the export of citrus fruit, and the establishment of District Fire Boards under the Bush Fires Ordinance, while the Alternative Crops Committee of the board dealt with ginger, export of pigeon pea and other produce, freight on citrus trees entering the country and the tung oil industry.

Colonial Development Fund.—The building works undertaken with a grant from the fund were completed as far as Zomba headquarters offices and laboratories and Zomba, Mlanje and Port Herald Experimental Stations were concerned, and progress is being made in the case of Lilongwe and North Nyasa Experimental Stations and the coffee plots. It is anticipated that the latter works will be completed for the most part in 1935.

The agricultural survey of central Nyasaland which was begun in 1933 was completed in 1934 as far as both field work and the preparation of a report and maps were concerned. It is hoped that the latter will be ready for issue at an early date.

Tobacco.

The tobacco production of the year under review is given in the following table and the 1933 figures are given for comparison.

Production

	1933		1934	
European-grown	lb.	lb.	lb	lb.
Flue-cured ...	2,304,400		2,667,728	
Fire-cured ...	717,136	3,488,016	872,928	3,895,136
Air-cured ...	466,480		354,480	
Native-grown				
Fire-cured ...		9,131,911	...	11,320,717
		12,619,927		15,215,853

Production thus increased by 2,595,926 lb. in which flue-cured and dark-fired leaf participated. European production increased by 11 per cent while native production of darks increased by over 23 per cent, a point which is referred to under a later heading. Exports, as shown in the following table, showed an increase in all kinds of tobacco.

Exports

	1933		1934		Increase or decrease
	Amount lb.	Value £	Amount lb.	Value £	lb.
Flue-cured	1,644,479	61,668	1,933,259	72,497	+ 288,780
Fire-cured	7,925,623	297,211	9,744,154	365,406	+1,818,531
Air-cured	824,396	30,915	866,713	32,502	+ 42,317

Figures of production and export should be considered along with figures of stocks and consumption in the United Kingdom. The following table is arranged to show Nyasaland's total production, her total exports, the consumption of her tobaccos in the United Kingdom and the stocks of leaf on hand in the United Kingdom for the years 1933 and 1934.

	1933 lb.	1934 lb.	Increase or decrease. lb.
Production (leaf)	12,619,927	15,215,853	+2,595,926
Exports (leaf and strips)	10,394,498	12,544,126	+2,149,628
Share of usings of Empire tobacco	29.0%	30.2%	—
Consumption in United Kingdom	12,072,128	12,523,368	+ 451,250
In stock at December 31 in United Kingdom	32,234,603	32,232,322	— 2,281

The statistical position is not clear. Of the total exports of tobacco the United Kingdom took 12,442,206 lb. On the other hand, her increase of consumption was less than 500,000 lb. and the stock in hand at the end of 1934 which might be expected to be greater than that of 1933 was actually smaller. The explanation of the apparent discrepancy may be found in the using up of old stocks and in the drawback thereon and on the stripping of dark leaf.

European.—Acreages and yields are given by districts in appendix F. The 1934 crop was disposed of as follows.

	Flue-cured lb.	Fire-cured lb.	Air-cured lb.	Totals lb.
Sold locally	1,710,800	682,304	242,480	2,635,584
Exported direct	337,344	25,872	66,752	429,968
Left on hand	619,584	164,752	45,248	829,584

The totals are compared below with those of 1933.

	1933 lb.	1934 lb.	Increase or decrease. lb.
Sold locally	2,291,520	2,635,584	+ 344,064
Exported direct	470,624	429,968	— 40,656
Left on hand	725,872	829,584	+ 103,712

The latter table shows an increase of the amount of tobacco sold locally in comparison with 1933, but it also shows an increase in the amount left on hand and a fall in direct exports. European production was only 23 per cent of the total and it cannot be pretended that the European industry is in a healthy condition. In fact, the state of the tobacco industry in general caused great concern to the Nyasaland Tobacco Association, and close touch with the Empire Tobacco Federation, the Southern Rhodesia authorities and the local Government was maintained. Discussion proceeded apace and careful examination of the position and of the views of the Empire Tobacco Federation brought about rapid developments towards the end of 1934. Action was taken through Government to appoint a representative in the East African Trade and Information Office in London who would maintain liaison with the Federation and also to bring before the home authorities the need for an enquiry into Empire tobacco production and marketing and for an increased use of Empire leaf. It was realised that local producers must bring themselves within some sort of control as a step towards organisation of the Empire industry, and the Tobacco Association eventually asked Government to promote legislation to ensure control of the European industry and the establishment of an export pool which would endeavour to prove to home buyers that standard grades could be produced and exported from year to year.

Native.— Native-grown tobacco was purchased from Crown-land and private-estate growers in the various district in the following quantities.

	Northern Province			Southern Province		
	Crown land lb.	Private estates lb.		Crown land lb.	Private estates lb.
Lilongwe	2,932,346	913,390	Mlanje	1,271,064	32,250
Dowa	1,475,946	198,849	Cholo	33,575	17,725
Dedza	266,346	—	Blantyre	449,817	120,855
Fort Manning	45,114	364,175	Chiradzulu	1,265,343	506,749
Ncheu	143,970	187,102	Zomba	272,969	781,032
	—	—	Upper Shire	42,100	—
1934	4,863,722	1,663,516	1934	3,334,868	1,458,611
1933	4,541,874	1,644,928	1933	1,933,324	1,011,785

The Native Tobacco Board continued its supervision of Crown-land growers. The question of control of amount of production was discussed by the board, and instructions were given to the field staff to limit production in accordance with market conditions and to prevent that over-production which is a serious menace to the dark tobacco industry. The size of the gardens of growers in the Northern Province was therefore regulated and, in the case of growers on land of less than medium fertility, a considerable reduction in size was made. It was perhaps unfortunate that control could not be made equally strict in the Southern Province where weather conditions and an increased body of growers led to an abnormally large out-turn. The numbers of registered Crown-land growers were: Northern Province 38,522; Southern Province 8,783. These figures represent a decrease of 3.9 and an increase of 34.6 per cent respectively when compared with the registrations of the 1932-33 season. The figures for 1932-33 were 40,088 and 6,524.

The quality of the crop in the Northern Province was somewhat disappointing owing to the high rainfall and cold night temperatures of the month of February, a period when weather conditions are of the greatest influence on the yield and quality of the crop. There was thus a marked scarcity of wrappers of the highest quality and an abnormally large quantity of short filler. The latter was received very unfavourably and in certain cases was kept out of the markets altogether.

Weather conditions in the tobacco areas of the Southern Province were good, and it is to be deprecated that quality left something to be desired owing to faulty curing which led to pole-burn and perished leaf.

The estimated prices paid to Crown-land growers were: Southern Province 1.25d; Northern Province 2.25d. Sums of £17,369 and £45,597 were therefore paid out to growers in the respective provinces, the corresponding figures for 1933 being £14,097 and £44,946. The average amounts produced per grower on Crown-land were: Southern Province 380 lb; Northern Province 126 lb. According to the above figures, each received on an average £1 19s. 7d. and £1 3s. 7½d. in the respective provinces as against an estimated receipt of £2 3s. 2d. and £1 2s. 4½d. in 1933.

The board's buying stations in the Northern Province opened on May 21. Buying in the Southern Province commenced a few weeks earlier. Licences to buy totalled 123. The amounts purchased at central buying stations in controlled areas were:

	lb.
Likuni	884,721
Lombadzi	789,678
Nathenje	751,899
Mponela	1,475,946
Mudi	506,048
Tiwi	266,346
Total	4,674,638

Purchases from Crown land in uncontrolled areas such as Fort Manning and Ncheu were 189,084 lb. Purchases from tenants on private estates were: Southern Province 1,458,611 lb; Northern Province 1,663,516 lb. The corresponding figures for 1933 were 1,011,785 lb. and 1,644,928 lb.

The total figure for the dark tobacco crop produced by native growers was therefore 11,320,717 lb. This amount may be considered to be too large for market requirements and can hardly be of assistance in reducing the large stocks of Nyasaland tobacco in the United Kingdom. It is the policy of the board to maintain a safety point of production, and it is fortunate that a second economic crop can now be produced by natives in the Southern Province and thus help to prevent the over-production which with an increased acreage and good weather conditions would undoubtedly occur.

The increased consumption of Nyasaland pipe tobacco is borne in mind, and, if it is true that further use is being found for a large quantity of certain grades, there must naturally be less ground for alarm than perusal of the above figures would indicate. The trend of the results of tobacco experimental work is discussed in appendix B.

The Nyasaland Native Tobacco Exporters' Association continued to give its views and advice for the information and guidance of the Department of Agriculture and the Native Tobacco Board. The principal matters under review in 1934 were the maintenace of quality of leaf, the production policy for the 1934-35 season, the reduction of the buying tax and the reorganisation of the Northern Province markets as regards both sites and internal arrangements.

Cotton.

Native.—The production of native-grown seed cotton amounted to 5,377 tons, a figure which compares well with the 3,079 tons of 1933. District details of production are as follows.

Southern Province	tons	Northern Province	tons
Lower Shire	2,870	Ncheu	22
Chikwawa	2,074	Dedza	33
Mlanje	63	Dowa	120
Central Shire	132	North Nyasa	27
Blantyre	31		202
Zomba	1		
Upper Shire	4		
	5,175		

Climatic conditions were good on the whole, and the season was marked by the interest of new buyers, by a fair average yield per acre and by improved prices to the growers. The average prices paid were—no. 1, 1.29d., no. 2, .84d., no. 3, .56d., and the total sum paid to growers was £56,374. The crop was estimated to give at least 1,700 tons of lint or the equivalent of over 9,500 bales of 400 lb. each. The proportion of no. 1 grade to other grades was smaller than in previous years, and special attention will therefore be given to marketing and grading during the 1935 season. In the matter of control of the industry on both growing and ginning sides the Cotton Ordinance of 1934 has now made the position secure.

The Lower River area, as the oldest-established cotton-growing area, produced more than ten times as much as the rest of the country, but future years will see a change in the position through the extension of growing in the Southern Province, especially in Mlanje, along the northern extension of the railway, and in the lake-shore areas of the southern districts of the Northern Province.

Spacing, inter-cropping and variety trials and strain tests were continued, and the industry continues to be indebted to the breeding and selection work of the Empire Cotton Growing Corporation. Perhaps the most notable movement on the growing side is the tendency towards earlier planting in general which is supported by experimental results and is encouraged by the Department of Agriculture. Notes on experimental work at Port Herald are given in appendix C.

European.—European production of seed cotton amounted to 368 tons, a figure which argues an increased interest in the crop. The 1933 production was 102 tons.

Tea.

The following table gives acreages and details of tea production and export for the past three years.

	Total acreage	Acreage in plucking	Total production lb.	Amount exported lb.
1932 ...	12,595	7,271	2,689,984	2,573,871
1933 ...	13,830	8,251	3,049,760	3,276,477
1934 ...	15,414	11,265	4,449,312	4,624,111

Of the total acreage 8,558 acres are in Mlanje and 6,856 acres in Cholo. It should be remembered that these figures refer to the calendar year and that the acreage at the end of the planting season of 1934-35 will be greater than the 15,414 figure. If all land cleared and ready for planting is planted up during the 1934-35 season, by the month of June 1935 the Mlanje acreage should be 8,570 and that of Cholo 7,028, a total of 15,598 acres. Included in these figures are 110 acres of seed-bearers.

The year under review was an eventful one for tea producers. Nyasaland tea interests had signified their adherence to the international scheme of restriction, and it was intimated that 7,000 acres would be allowed to the East African territories for new planting. This amount was afterward increased to 7,900 acres and Nyasaland's share was given as 2,000 acres. In the meantime, local producers came together in their own interest and formed the Nyasaland Tea Association which represented practically all tea growers and absorbed the old Tea Research Association. The association has advised Government in matters of restriction and has co-operated in the particular matter of the allocation of the 2,000 acres for new planting. It was felt that the guiding principle of the allocation should be the need to bring up to an economic unit acreage the smaller developing estates, especially those which had begun tea planting in the years when conditions were less promising and had persisted in increasing their acreages through the lean years of low prices which preceded restriction. The aim was to allow the developing estates to increase to 500 acres, but it was found that the allocation was insufficient for this purpose. In fact, it proved insufficient to allow of a unit acreage of 400 acres, and at the end of the year negotiations were in progress to secure a further quota for Nyasaland. The case for an increased quota was so strong that Government felt itself justified in taking it up. Meanwhile, new planting up to the temporary limit allowed has progressed steadily, and several new and well-equipped factories came into operation during the year. The total number of working tea factories is now 16. Other items of interest were the passing of a Tea Ordinance to control the amount of planting under restriction and the withdrawal on October 1 of the 40 per cent. remission of rent of tea land.

The new tea experimental station at Mlanje is now in full working order, and experimental work on soil erosion and its control, on pruning methods, on fertiliser treatments and on degrees of intensity of plucking are in progress. In addition, laboratory investigations by the Mycologist have shed useful light on problems of tea seed storage and germination. Details of interest will be found in appendix D.

The help of the Imperial Institute was extended to the industry from 1931 to 1933 to enable samples of made teas to be examined and reported upon with a view to throwing light on certain points of interest in local tea manufacture. The results were summarised in the *Bulletin of the Imperial Institute* of April 1934. Perhaps the point of greatest practical interest and value concerned the mixing of leaf of local and Indian jats prior to manufacture, and it was satisfactory to be assured that "the results clearly show that the return on teas manufactured from mixed jats is equal to that from the jats sold separately."

Coffee.

The encouragement of coffee growing by natives was continued during the year under review. Demonstration plots have been established in Cholo, Zomba and North Nyasa, and seedlings have been distributed.

As far as European growing of coffee is concerned, interest in the crop seems to be on the wane. The total acreage is falling and the 1934 production was less than that of 1933 despite a greater acreage in bearing.

	Total acreage	Acreage in bearing	Production cwt.	Amount exported cwt.
1932 ...	1,449 ...	531 ...	767 ...	788
1933 ...	1,210 ...	618 ...	1,128 ...	357
1934 ...	1,188 ...	805 ...	1,039 ...	366

Other Crops.

The acreage under tung oil increased from 65 in 1933 to 184 in 1934. This satisfactory state of affairs is due to European enterprise and it is backed up by the former encouraging reports on the *Fordii* oil and by a recent good report on the *montana* oil. It is understood, however, that tung oil growing in Nyasaland must still be regarded as in the experimental stage for few data are yet available regarding the best local conditions for *Aleurites Fordii* or *A. montana*. On the other hand, it can again be said that, on the whole, the growth and fruiting of the tung trees are satisfactory.

European agriculturists had 165 acres under chillies and capsicums, 1,455 acres under maize, 70 acres of wheat, 3,752 acres under legumes, 99 acres under oil seeds, 349 acres under fruit trees and 2 acres of nut-bearing trees, and increased interest in the growing of citrus is evident.

Native Food Crops.

A satisfactory season can again be reported. Locust damage was confined to certain small areas and there was no serious shortage. When a shortage of food supplies did occur, it was due to light rains, drought or locusts and could not be attributed to insufficient planting. Maize yielded well and was of good quality. Millets also gave good yields and showed little or no disease, while the quality of pearl millet in the Lower River was reported as excellent. In the same area, the use of sorghum as a food crop is on the decrease. It gives poor crops over a run of years, it is subject to locust attack, and it does not inter-crop well with cotton. Witchweed was less in evidence than usual. On the whole, pulses yielded good crops, but early beans were poor in the central part of the country. At Kaporo in North Nyasa, native growers in the Misuku hills and the upper valley of the Songwe river sold 47 tons of beans. The sweet potato crop was most successful and cassava also did well. Good groundnut yields were obtained but it is doubtful if there was a large surplus for sale for export.

Rice crops in the Lower River and central Nyasaland were above normal in amount. In North Nyasa and on the lake shore, production amounted to about 400 tons of which about 150 tons were sold to Government and other purchasers.

Seed selection was encouraged in the districts with special attention to pearl millet at Port Herald and to finger millet in North Nyasa. On the Makwapala Experimental Station selection and observation trials on millets, sweet potatoes and cassava are in progress. Considerable attention is being devoted to native methods of mixed cropping with particular reference to cotton, groundnuts, pearl millet and maize. The Zomba Experimental Station is well situated for propaganda work and many issues of seed and plants of improved varieties of crops have followed from the interest of native cultivators in the station.

PART II.—Work of the Department of Agriculture.

District Work.—Mention has already been made of experimental work in hand under the headings of *Tobacco, Cotton, Tea* and *Native Food Crops*. The various lines of work have a thoroughly practical bearing on local problems, and the results should bring about in time various improvements in local agricultural methods and the use of land. Increased attention was given to soil erosion. Progress was made in terracing and storm-draining while the clearing of steep slopes was discouraged. The making and use of compost in native gardens is regarded as an important factor in the maintenance of soil fertility, a problem which is becoming acute owing to increase of population and decrease in the amount of land at the disposal of the native cultivator, and a simplified method for use under village conditions is being sought. It is realised that it is far more difficult to turn the results of experiment into practice on a large scale than to obtain the results, and, on that account, increases of the field staff of the department, consisting of one district agricultural officer and eight temporary agricultural supervisors, were welcomed.

Chemistry and Soils.—Attention is directed to the report by the Assistant Director of Agriculture on the work of the Zomba and Lilongwe Experimental Stations which are his special charge. The report is to be found in appendix B. The continued experimentation on the Zomba station over a period of years is leading to definite results which are indicated in the report, especially those dealing with organic matter from different sources and with mineral fertilizers. Capt. Hornby's present conclusion is that, in dealing with the lateritic red loams which are characteristic of the station and of large areas of the country, mineral fertilizers are rarely required provided proper attention is given to organic matter, rotations and control of soil erosion.

The Assistant Agricultural Chemist reports as follows. "The preliminary work on the soil samples from the agricultural survey of the Northern Province was completed in the early part of the year. This work has been carried out on the lines indicated in my report for 1933, and 59 profiles, involving about 425 samples, have now been examined by these methods. The majority of the results have been reduced to graphical form in order to assist comparison, and it is proposed to confirm the apparent similarities and dissimilarities of soil types, as shown by the diagrams, by additional investigations of typical samples. Work is in progress on the silica-sesquioxide ratios in certain cases in the hope that further correlation may be found between chemical weathering and rainfall and perhaps elevation. Further work will include the determination of exchangeable bases in representative cases.

"Relatively little field work has been done during the year under review. The sulphur and calcium experiments at Lujeri Tea Estate have produced no significant results. I understand that the incidence of *yellows* has decreased very markedly in the whole of the area on which the experiments are situated and that no conclusions as to the efficiency of the treatments are possible. An experiment started at my suggestion, on the Zomba Experimental Station, to test the relative efficiency of different methods of tobacco cultivation has also yielded inconclusive results."

Dr. Armstrong Black was also engaged in compost investigations, in treatment of tobacco for the West African market and in analyses of waters, stomach contents and other diverse materials.

Thanks are due to the Director of Geological Survey for many soil samples of the various horizons taken from profiles exposed during water-supply work. This help and the exposure of numerous profiles during the agricultural survey of 1933 have greatly extended local knowledge of soil groups and series and their distribution in Nyasaland.

Entomology.—The Entomologist devoted most of his time during 1934 to locust work (see appendix A), but, in addition, a preliminary short study of red spider (*Tetranychus bioculatus*) of tea was made in the Mlanje and Cholo tea areas. Certain data concerning the life-history of the pest were obtained, and these, together with suggestions for its control by both agricultural and artificial methods, were explained in a leaflet sent to all tea planters in September. It is hoped that further work on this pest will be possible when the locust problem is less intense than at present.

Mycology.—The report of the Mycologist (appendix D) is of great interest to tea planters. Mr. Leach discusses scorch diseases of seedling stems and of young flush of tea, coffee bark disease, diseases of mango and fruit scab of avocado. Attention may be directed to the new light thrown on the cause of the mango and avocado scabs, rot and spots, but the work on tea seed storage and germination is of even greater interest for the practical man. It has been found that, on a small scale, tea seed keeps best when dried to a loss of 5 per cent. of its ripe weight. For large quantities, three methods of storage are under investigation. The conditions which give an increased rate of seed germination are also discussed.

Botanic Gardens, Zomba.—Efforts to renovate the soil of the gardens have been continued. Terracing and growing of pigeon pea are slow methods, but it is hoped that the gardens will in time be more worthy of the name. They are used in part as a plant-introduction station, and the brush wood and trash find a use in compost making.

Plant Introductions.—Full notes on the various introductions of recent years have been compiled by the Assistant Director of Agriculture and are to be found in appendix E.

Publications.—The following departmental publications were issued or prepared during the year

Bulletin No. 9 *Climate of Central Nyasaland*, by A. J. W. Hornby.

Bulletin No. 11 *Denudation and Soil Erosion in Nyasaland*, by A. J. W. Hornby.

Bulletin No. 12 *The Rices of Northern Nyasaland*, by F. Barker.

Bulletin No. 13 *A Short History of Tea Planting in Nyasaland*, by G. G. S. J. Hadlow, Hon. Secretary, Nyasaland Tea Association.

Rainfall maps of Nyasaland, compiled by A. J. W. Hornby.

Summary of the Results of the Agricultural Survey of Central Nyasaland, by A. J. W. Hornby assisted (in part) by W. L. Maxwell.

The issue of the last-named publication has been delayed to await the receipt of soil and land-utilization maps which are being prepared in Salisbury through the courtesy of the Surveyor-General of Southern Rhodesia.

Staff.—The following officers were on leave in 1934. Dr. W. Small, M.B.E., Director of Agriculture, from January 1 to 9, Mr. J. A. Callow, Senior Clerk, from March, 1 to October 28. From January 1 to 12, Capt. A. J. W. Hornby, M.B.E., acted as Director of Agriculture, Capt. C. Smee, M.C., Entomologist, acted as Assistant Director of Agriculture, and Dr. I. W. M. Armstrong Black, Assistant Agricultural Chemist, acted as Agricultural Chemist. Mr. R. W. Kettlewell, District Agricultural Officer, arrived on August 22 on first appointment and was posted to the Ncheu, Dedza, Dowa and Kota Kota districts with headquarters at Dedza. Towards the end of the year, the field staff of the department was augmented by the appointment of eight temporary Agricultural Supervisors, viz., Messrs. A. C. Williamson, C.D.A., W. L. Maxwell, J. W. Pryor, J. A. Miller, D. N. Smalley, G. C. Dow, G. M. Boby and F. D. W. Stephens.

Financial.—The following figures give an analysis of the cost of the Department of Agriculture ring the year under review.

	Approved estimate	Amount spent
PERSONAL EMOLUMENTS:	£	£ s. d.
European staff	7,514	7,627 9 4
Native staff	587	560 9 9
	8,101	8,187 19 1
OTHER CHARGES:		
Transport	640	789 8 11
Travelling	—	4 18 6
Passages	422	273 16 3
Experimental Work	475	456 0 3
Distribution of Cotton Seed	200	1,056 18 6
Botanic Gardens	45	40 7 6
Contribution to Agricultural Show ...	120	120 0 0
Treatment of Plant Diseases, Tobacco Pests, etc...	150	61 15 3
Library	40	38 2 10
Tools and Equipment	200	140 11 11
Seeds and Plants	50	34 2 1
Incidentals	20	18 4 8
Uniforms	21	19 9 2
Native Cotton Industry	100	81 5 10
Contribution towards Upkeep of Experimental Stations E.C.G.C.	600	600 0 0
Transport (E.C.G.C.)	275	274 14 5
	3,358	4,009 16 1
SPECIAL EXPENDITURE:		
Two Tents	28	— — —
Anti-Locust Campaign	1,200	448 11 9
Development of export crops	—	8 8 3
	1,228	457 0 0
	12,687	12,654 15 2

PART III.—EMPIRE COTTON GROWING CORPORATION.

Mr. W. L. Miller returned from leave in March and Mr. H. C. Ducker went on leave in August. Mr. S. T. Hoyle was stationed at Domira Bay throughout the year, and he and Mr. Miller were responsible for the report on the work of the Domira Bay Cotton Experimental Station from which the following extracts are taken.

"The final result over 44 acres of bulk cotton was 260 lb. lint per acre, an increase over last year of 10 lb. per acre, but this year there was practically no locust damage. Thus, in spite of a bad start to the season, Domira Bay once more lived up to its reputation of being a safe place in which to plant cotton.

"This season was the first in which the full 150 acres have been under cultivation and the yields of the latest cleared fields in their first year indicate that they are likely to prove some of the best land on the station. In the coming season the first cleared land is due to be planted with cotton again and it will be interesting to see how it behaves after the first rotational cycle has been completed. An effective system of storm drainage has been completed and any fields with a pronounced slope have been contour drained and it is confidently expected that there will be no trouble from erosion.

"*Strain Trial.*—The site for this experiment proved to be an unfortunate choice as not only was the field more uneven than is usually the case but the average yield was 230 lb. lint per acre, 30 lb. less than the average for the whole station. Owing to the unevenness the result of the experiment was not statistically significant. There were eleven strains of *U4* in the experiment, some selections from Barberton and some locally selected. The final order in terms of yield was substantially the same as last year with the notable exception of *U4.4.2-955* which fell from second to tenth place. This strain, though exceptionally early and producing a small compact bush in a good season, does not stand up as well as the other strains to adverse conditions. It would not therefore seem advisable to plant this strain except in situations where the climate warrants the planting of a very early plant to the exclusion of other considerations.

"*Spacing Trial.*—This was a repetition of last year's experiment with nine spacings ranging from 14,500 to 29,000 plants per acre. The yield on this field was very satisfactory averaging over 300 lb. lint per acre. Once again there was no significant difference between the various spacings and one is more and more faced with the conclusion that within wide limits the spacing of the plants makes no difference to the final yield under the conditions of the lake-shore climate. So long as there is an even germination it does not matter if the plants are spaced one foot or three feet in the row. The only certain conclusion from these experiments is the well known one that close spacing produces an earlier crop but under Domira Bay conditions the final yield is not affected. The experiments will be continued for another year and a rather more elaborate analysis of the yield made, and if no further problems suggest themselves the experiment will be abandoned.

"*Breeding Work.*—This year the breeding block suffered some damage from a miniature cyclone which also unroofed the newly built laboratory but no permanent harm was done to either. The same substrains of *U4* were carried over from last year and a rough analysis showed that these are splitting for various characters. It is proposed in the coming season to make a complete classification of all the available stock and eliminate the redundant strains. The more promising of the small lots are being grown in small bulk and later will be put into strain trials. The crosses, mainly between *U4* and *Cambodia* and *U4* and *Over-the-Top*, were carried a stage further, and it is hoped that it will be possible to fix a strain before long. At present it can be said they show considerable promise. Dr. Harland sent 203 crosses from Trinidad and these were grown in observation rows. While the great majority of these proved to be unsuitable for Nyasaland conditions, many of them being highly jassid susceptible and have been discarded for this reason, about twenty were selected for further trial next year.

"*Cotton Stainers.*—A start was made this year in recording the infestation of stainers on the station. The method used was that advanced by Mr. Pearson of the Insect Pest Control Section of Barberton and gave satisfactory results. Host plants of stainers were observed in the vicinity of the station and the migration to the cotton fields was noted. The amount of stained cotton was not great as has always been the case and it is hoped to extend the observations next year to other areas where there is a greater amount of staining.

"*Locusts.*—These first made their appearance on the station early in December, five weeks earlier than had been the case last year and considerable damage was expected. Breeding took place on and around the station about mid-December. The early flying swarms ate some freshly sprouted maize but did not kill it and also ate some early planted beans which were killed off. Many of the egg-masses were parasitised and no damage was done by young hoppers. At the end of March a small swarm of fully grown hoppers approached the station but was killed before any damage was done. The young flying swarms passed over the station in early April on their way from the lake shore to the hills where they appear to remain for the winter. Two or three swarms spent a night on the cotton fields and by eating the bark caused some maturing bolls to drop off but the total damage was very slight.

"*Lilongwe.*—Last year's selections were grown again and owing to the late season or other causes did not do as well as had been hoped. Some selections which were made in this adverse season may, however, prove very valuable. It cannot be said of any of the present selections that they can be relied on to give a commercially paying yield in this area though it is hoped that one will be isolated before long. As the climate of the Lilongwe plateau appears to resemble that of Gatooma more than the present cotton areas of Nyasaland, some selections have been sent from the Corporation's station at Gatooma and will be tried out here next season.

"*Rotations.*—The main rotations of the station as detailed in previous reports are pigeon pea, maize and various beans under observation.

The area under maize has been retained at 30 acres, consisting of 20 acres of Potchefstroom Pearl and 10 of Honduras Yellow. Although some difficulty was experienced at planting time owing to light rains the final stands and yields were excellent. In the coming season it is planned to make a large number of selections from native grown maize for growing on the station as a cob to row experiment. The selections will be confined to a small hard white dent type which it is hoped will be suitable for export.

The chief difficulties against successful crops of beans have been damage by locusts and inexperience of the correct time of planting. In this connection it is interesting to note that in this area the native grows his main crop of beans as a summer crop on sub-irrigated *madimba* land. The varieties grown, bush Lima (*Phaseolus lunatus*), a white kidney selection (*Phaseolus vulgaris*), Tepary and green gram should all do reasonably well and will continue to be grown and experiments carried out to obtain further knowledge of the time of planting problem.

Groundnuts are a success and may become an important native export crop. There are now three strains grown on the station, a bunch variety (Spanish) from Makwapala, a selection made at Barberton and a variety from Gambia said to be resistant to rosette disease. The five acres of Spanish bunch yielded nearly 1,500 lb. per acre. The two other varieties were grown as garden plots. The one from Barberton appears to be much more susceptible to rosette disease than the other two.

In addition to the main Kenya bulk of pigeon pea there are three varieties from Pusa which have ratooned successfully and will be kept under observation, also a white variety of Dr. Harland's. In view of the locust menace which continues several seed stocks of varieties of cassava and sweet potatoes are being kept up.

"*Buildings.*—The programme of new works commenced last year has provided the station with buildings which should prove sufficient for a considerable time to come.

The laboratory, store and two offices under one roof were completed just before the 1933-34 rains. During the present dry season another dwelling house, garage, boys' quarters, ginnery, maize store and building to house the bore-hole pump and motor have been practically completed. It is still hoped to erect a garage for the use of visitors.

The house is built on the same plan as the original one built in 1931 with minor modifications for general convenience and appearance. The ginnery and power-house is a copy of one belonging to the British Cotton Growing Association about 7 miles from the station with the addition of a store for seed and baled lint and a lean-to for the disintegrator. All the plant, including Robey steam engine, cotton press, two 40-saw gins, shafting etc. which are on loan from British Cotton Growing Association, have been installed and used for the ginning of this year's crop.

In addition the steam plant will be used to drive a dynamo for supplying electric light to the houses and offices and power to drive an electric motor to operate the bore-hole pump and the disintegrator.

The maize store, planned to hold approximately 30 tons of maize in the cob, is built to allow the free passage of air through the stored grain.

The water from the bore-hole is pumped into an elevated tank and runs from thence to the houses and office by pipe lines. A water channel has been constructed so that the garden plot may be irrigated. The garden plot is of sufficient size to provide for all domestic needs and also to allow of room for special lots of cotton. By means of irrigation it will thus be possible to grow two generations of cotton in one year and so considerably speed up the breeding programme."

The contribution of Nyasaland to the work of the corporation amounted to £874 14s. 5d. £600 being devoted to experimental work and £274 14s. 5d. to travelling.

PART IV. Native Tobacco Board.

During 1934 the board was concerned with the amount of production of Crown-land growers in the 1934-35 season, leaf for the West African market, the quality of the crop in general, the reorganisation of the buying stations in the Northern Province with a view to their more permanent nature, medical arrangements for buyers at Lilongwe, sanitation of the buying stations, power to destroy unsaleable leaf, extension of supervision in Ncheu, tobacco growing in North Nyasa and the reduction of the buying tax. Experimental work at Zomba and Lilongwe which deals particularly with tobacco and associated crops was financed by the board.

Following Mr. Clegg's resignation, Mr. Tylor was appointed Agent and Senior Supervisor. Mr. J. W. Guise was appointed clerk at Lilongwe. Mr. Pryor and Mr. Du Frayer left the service of the board, and the number of field supervisors at the end of the year was thus eight.

The following members of the staff of the board were on leave: Mr. Tylor from January 1 to February 1, Mr. Sanderson from June 29 to December 25, Mr. Burton from June 29 to December 25, Mr. Smithyman from January 1 to February 8, Mr. Jackson from January 1 to 30. Mr. J. A. Callow, secretary of the board, was absent on leave from March 1 to October 28 during which period Mr. J. A. A. Channer acted as secretary. The members of the board were the Hon. the Treasurer, the Assistant Director of Agriculture, the Hon. Mr. Tait-Bowie, O.B.E., Mr. A. F. Barron, O.B.E., and the Director of Agriculture as chairman. In the beginning of 1935 the Provincial Commissioner, Northern Province, was made a member.

The statement of revenue and expenditure for 1934 will be found in appendix F.

W. Small,
Director of Agriculture.

Report of the Entomologist.

Locusts.

Entomological work was again devoted almost entirely to locust studies throughout the year. The annual report for 1933 traced the development of the invasion up to the appearance of the first flying swarm in the South Nyasa district on February 23rd.

Locusta migratorioides.—Pure hopper bands of this species of locust were only recorded from the western side of the North Nyasa district, where it was noticed that this species was not attacked by the fungus disease although it was present in adjacent bands of *Nomadacris* hoppers. Flying swarms developing from these bands are thought to have travelled into North-eastern Rhodesia and were probably not more than three in number. Adults developed in January and February in Fort Manning, Kasungu and Dowa districts from swarms comprised mainly of *Nomadacris.* A few specimens of adult *Locusta* were found inhabiting the dry bed of Lake Shilwa in July, and some specimens were caught and caged in September. The majority had assumed an almost pure-black colouration though one female was a typical phase *solitaria.* Nine females collected between September 5th-12th all possessed well-developed eggs. Two other females and one small male, all black in colour, were caged on September 13th and copulation was noticed some days later. On September 20th an aborted egg-packet was laid on the woodwork of the cage and a normal egg packet was found in the soil some eight days later. Ten hoppers emerged on October 20th, the remaining eggs being, apparently, infertile. Only three reached maturity, all being typical phase *solitaria* in colouring and all small specimens (50 mm. from apex of head to tip of wings). Though no intensive search of the Lake Shilwa area was possible no *Locusta* hoppers were observed there during four visits made since the eggs hatched in captivity, though two adult females of normal size and *solitaria* colouring were caught at the end of December, one of which was certainly an old specimen from the damaged state of the wings.

With one exception, no pure flying swarms of *Locusta* were recorded in the Protectorate during the dry weather. One swarm, however, entered the Fort Manning district in September and hoppers were reported as hatching there on December 21st.

Nomadacris septemfasciata.—It was recorded in the annual report for 1933 that the hopper bands were severely attacked by the fungus disease, *Empusa grylli.* This natural control, coupled with exceptionally wet weather not experienced in the previous three years, was responsible for a hopper season of unexpected mildness as regards activity of the bands, though the area infested was considerably larger than in previous years. The movement of the bands was, in many cases, practically negligible during the whole of the development to the adult winged stage presumably on account of the wet weather, and in the lake shore area of the Dowa district the phenomenon was observed of scattered hoppers remaining practically quiescent in the jungle grass for weeks on end without making any attempt to form into bands.

Apart from the fungus disease taking a heavy toll of the hoppers in most districts, there are definite records of some bands failing *entirely* to reach maturity. This occurred in two places in the north-west corner and three places on the lake shore of the North Nyasa district, in four places on the western side of Mombera district, and on the lake littoral of the Chintechi district. In the latter case only are meteorological records available for the actual situation where such wholesale natural destruction took place. For the three months January to March, when hopper bands were present the total precipitation was 29.92 inches over 44 days and if the April rainfall, which occurred mainly in the first three weeks of the month, be added the high total of 48.08 inches over 62 days is obtained. Although this figure is 10.05 inches greater than the corresponding period of the previous year (60 days), the difference in mean monthly temperatures was very slight, the average of the four months' means being 73.3°F in 1934 and 75.25°F in 1933.

The disease appeared to be more prevalent in the northern half of the Protectorate than the southern and in the Chikwawa and Lower Shire districts was recorded only from the foothills, not being found among the hopper bands along the Shire river bed.

Development of Flying Swarms.—The prolonged oviposition period from October 1933 to January 1934 and perhaps even later, the fact that in certain places oviposition took place in identical situations at widely separated intervals (1), and the progressive destruction of hopper bands by disease resulted in the development of flying swarms being somewhat irregular in the various districts, but showing a definite line of progress through the country from south to north. In the south of the Protectorate (Lower Shire and Chikwawa districts) flying swarms developed in February and continued into March. In the Shire highlands (Mlanje, Cholo, Blantyre, Chiradzulu, and Zomba districts) the first flying swarms were not recorded until March. Although at lake level (1,550 feet) in the South Nyasa district the first swarm was observed on February 23rd, general flying swarms did not occur until March and on the lake littoral of the Dowa district early in April was the first record. At the higher altitudes of the Ncheu and Dedza districts flying swarms were not observed until April and still further north (Lilongwe, Fort Manning, Kasungu and North Nyasa districts) they did not develop until May.

(1) South Nyasa. Chiusi dambo 24.11.33 and 10. 1.34.
Namwera 24.11.33 and 18.12.33.
Malombe 3.12.33 and 28.12.33.

Whether there had been later egg-laying than was reported, a prolonged incubation period, or whether the development of the hoppers was retarded it is not easy to state with accuracy, but several instances were observed of the presence of hoppers at an unexpectedly late date. At Lilongwe, recently developed sixth stage hoppers in very considerable numbers were found on May 18th in several swarms of which a fair proportion had already attained wings. In the North Nyasa district sixth stage hoppers were reported in April in places where hatching was known to have occurred before the beginning of February. A hopper band in the second instar was found in the Chiradzulu district on March 20th although flying swarms had developed there earlier in the same month. Careful enquiry produced no evidence that there had been a prolonged egg-incubation period. Late egg-laying, unreported, did undoubtedly occur but that hopper development was also retarded beyond the normal eight weeks seems decidedly probable. Taking into consideration the fact that, as a result of the prolonged oviposition period, hopper bands of varying ages might quite possibly have become intermingled, in the Lilongwe district in particular where it was possible to keep hopper bands under reasonably continuous observation it was found that winged swarms were not formed until early May from hoppers that had hatched in the latter part of January.

Movement of Flying Swarms.—The continuation of the rains into the normally dry months of the year rendered the movement of the flying swarms considerably more difficult to follow than in the previous year, not only by equalising the conditions between the plains and the hill but also by influencing the swarms to remain practically quiescent for considerable periods.

In two areas, however, a definite vacation of the lower levels and a movement into the higher elevations, very comparable with the previous year's observation, can be recorded. At the southern end of the Shire valley, swarms in the Chikwawa district moved mainly into the hills to the north and north-east during April and the district was reported free in May, June and July; in the Lower Shire district the movement was more to the north-west and west, with swarms crossing the river from Portuguese East Africa, complete absence of swarms occurring only in June and July. The westerly and north-westerly movement from the lake shore level of the Dedza and Dowa districts began early in April, and this area was free of swarms by the end of that month.

During the latter part of May there were indications of a similar movement through the Upper Shire, Ncheu, Dedza, Lilongwe and Kasungu districts and a slight north-easterly trend into the Namwera hills of the South Nyasa district. Elsewhere in the Shire highlands flights were very indefinite but there was considerable concentration round Mlanje mountain.

Pre-breeding Flights.—In spite of considerable local indefiniteness, the general tendency of this movement duplicated that of the past season. Towards the end of August one large swarm from Portuguese territory crossed the Shire river near Port Herald, flew up stream into the Chikwawa district and passed into the hills on the western boundary. From September to November numbers of swarms invaded the Lower Shire district from the south-east and the Chikwawa district from the south-west, moving in a general northerly direction. During November and December there was a marked northerly movement throughout the Shire highlands and from the Dzalanyama mountains on the western border of the Angoniland plateau flying swarms penetrated to the lake shore in the Dowa district by the end of November, following almost identically the same route as in 1933. The northerly movement was continued up the lake shore to the Chintechi district. Towards the end of November swarms crossed Lake Nyasa from Fort Maguire on the east to Domira Bay on the west coast and were also observed passing north over Likoma Island.

On the other hand, north of parallel 12°S on the western boundary of the Protectorate and in North Nyasa, the movement was, for the most part, completely reversed, but again was in keeping with the previous year. Late in November, swarms, some of which contained *Locusta* specimens, entered the north-west corner of Mombera district from Northern Rhodesia and mainly travelled south near the western side of the district, but with a small proportion moving south-east which reached the lake shore in the vicinity of Nkata Bay early in December. At about the same time in November large swarms flying south from Tanganyika Territory crossed the Songwe river near the lake shore and penetrated the North Nyasa district. During December, for some reason, swarms, possibly those just mentioned, emanating from the Nyika plateau took a direct northerly course and recrossed the Songwe into Tanganyika.

Size of Flying Swarms.—In spite of the 1933-34 hopper bands developing in a scattered fashion and being attacked by disease with the result that the initial flying swarms were also of a somewhat scattered nature, an unexpected character of the swarms that made the pre-breeding flights was their tremendous size, in many cases being very much larger than anything previously experienced in the Protectorate. The cause of this is obscure but it is suggested that the prolongation of the rains provided a longer period in which the individual swarms would chance to come together than under drier conditions when sustained flights would have commenced some months earlier. At the same time there is the fact that, taking the country as a whole, flying swarms were developing over a period of some four months, from February to May.

Egg-laying and Early Hopper Development 1934-35 (9th generation).—In the very large swarms mentioned above the individuals did not become sexually mature all at the same time and therefore as maturity was reached a considerable breaking up of the swarms occurred. Consequently egg-laying did not take place in tremendous concentrations but was spread out over a very extensive area.

The earliest egg-laying recorded was at the end of October or beginning of November in the vicinity of Lake Shilwa where hatching on a small scale occurred on December 3rd. Oviposition was general throughout the country during November and December; by the end of the latter month small scattered hopper bands were reported from nearly every district and hatching continued into January 1935. Up to this time the North Nyasa and Mombera districts appeared to be very slightly infected, but elsewhere flying swarms were still active with the possibility of further egg-laying producing a repetition of the lengthy oviposition period experienced in the 1933-34 season.

The destruction of egg-packets by the grubs of *Mylabris* beetles (*nkongoni*) appeared, in many districts, to be even more extensive than in 1933-34 and a hymenopterous parasite, *Scelio* sp., was reared from eggs found in the Cholo district.

Reports, both European and native, from the Upper Shire district indicated that egg-packets laid in low-lying areas in early November had been destroyed by rain by the end of December, but this failure to hatch may have been caused by parasites.

Parasitism of Hoppers and Adults.—Fly parasites and nematode worms were present to a moderate extent in both healthy and fungus-attacked hoppers and such parasitism continued, on a small scale, among the swarming adults throughout the year.

Fungus Disease (*Empusa grylli*).—Owing to the unusual rainfall this disease continued to function, spasmodically, among the flying swarms during the winter months but towards the end of the year it was recorded, in some places, that destruction on a large scale was again taking place, though possibly some oviposition had already been made by the locusts thus killed.

Damage.—As has been mentioned above, the slight activity of the hopper bands and the slow development of the flying swarms allowed the 1933-34 crops to be harvested without any serious loss. Only small sections of a few districts found themselves with short food supplies. As usual during the winter months, flying swarms confined themselves mainly to jungle trees where considerable defoliation took place, even of the early spring growth. Severe damage to citrus and other fruit trees through the bark being eaten as well as the foliage also occurred.

The exceptional earliness of the 1934-35 planting season, however, provided conditions under which more damage than had previously occurred could be and was done by the mature flying swarms. The first planting of maize and cotton carried out in late October and November was, in some cases, completely destroyed by the maturing swarms then making the pre-breeding flights and second plantings did not entirely escape. During late December 1934 and early January 1935 the scattered remnants of the swarms that had broken up during and after egg-laying were responsible for a certain amount of damage. In many cases, however, feeding by the locusts did not destroy the growing point of the maize plants and recovery was assured where weather conditions permitted.

For the first time in the Protectorate, newly planted tobacco in the field was attacked and destroyed or seriously damaged in November by flying swarms about to oviposit.

Future Outlook.—At the time of writing this report the outlook is obscure. Reports as to the seriousness of the damage done to the new crops by the remaining flying swarms are conflicting. Climatic conditions will play a large part in controlling the activity of, and therefore potential damage from, the hopper bands and the rapidity of their development and that of the crops will decide whether new flying swarms will be in existence before the crops are in a fit state to be harvested.

Once again it must be repeated that, as the last locust cycle concerned Nyasaland for some sixteen years, there is, at the moment, no reason to believe that the present one will come to an end any more rapidly.

COLIN SMEE,
Entomologist.

Report of the Assistant Director of Agriculture.

Zomba Experimental Station.

Work on the experimental station includes the collection of meteorological data from first-class instruments, the continuation of a large number of field experiments, the production of seed of improved varieties of various crops, and the demonstration of correct methods of soil and water conservation. Medium-scale plantings of *arabica* and *robusta* coffee and of citrus and *montana* tung oil are under careful observation. Some forty cattle have been supported by the station during the year and have served very useful purposes in the manufacture of Indore compost and in various other directions. All are in good health, and most of them will soon be sent to the Lilongwe station, where they will form a nucleus for stock improvement and take their due place in the agricultural programme of rotations, ploughing, and manuring.

It must be emphasized at this stage that the value of the work on the Zomba station is to be assessed on the area in which the results of correct rotations and manuring, erosion control, and better management of food supplies are applicable. The lateritic red loams with red loams of incipient laterisation in close proximity on the Zomba station are found covering large areas in zone H, the highlands of the Zomba-Blantyre road and smaller areas elsewhere where the average annual rainfall varies from 36 to 56 inches. The population in such areas must be regarded as of high density, and concomitant evils due to past shifting cultivation, soil exhaustion and soil erosion are very apparent.

The experiments during the last few years (1926-1934) have been designed to show (*a*) the value of ridge terracing and silt pits for minimising erosion, (*b*) the possibility of obtaining good yields of various food crops and tobacco by rotations including various leguminous crops, and (*c*) the due place that manuring must take in such rotations. Supplementary to such work has been the preparation of organic manures such as cattle manure ordinarily prepared with bedding, Adco compost (1927-28), and, more recently, the preparation of Indore compost on a large scale.

The requirements of such soils for various mineral fertilizers or for stimulating nitrogenous fertilizers at certain stages of crop growth have not been lost sight of.

Endeavour has always been made to compare the agricultural significance of the work on the station with proved agricultural practices in other countries possessing similar soils and climates. Particular interest at this stage is therefore taken in a treatise on West African agriculture published last year, especially in the sections on farming systems which have been found both feasible and much more profitable than various systems of shifting cultivation, "bush fallows" and mound cultivation adopted by various native farmers from time immemorial.

It is now possible to say for large areas of the highlands of Nyasaland where large numbers of families must now become identified with certain pieces of land that systems of mixed farming will answer best in some areas, green-manuring systems in others, and on the red soils of the Zomba-Blantyre highlands a judicious combination of the two accompanied by ridge-terracing is the best possible system. The yields of the various crops which are now obtained in the average season on old land under this system are one criterion, but the arrangement of experiments on a Latin square or randomized blocks has not been neglected and results having statistical significanee have been obtained.

Studies of organic matter from different sources.

Experiment 1. Latin square. Yields of maize.

		1932-33	1933-34	Average yield per acre	Difference in lb.
		lb. per acre			
1	Cattle manure: 10 tons per acre ...	1,527	2,305 ...	1,916 ...	293
2	Cotton seed: 3 tons per acre ...	1,496	2,555 ...	2,025 ...	302
5	Control	1,421	2,025 ...	1,723 ...	—
4	Green manure: sunn hemp ...	1,554	2,215 ...	1,884 ...	161
5	Cattle manure: 5 tons per acre ...	1,378	2,185 ...	1,781 ...	57

The difference in effect between these applications just fails to be significant.

Experiment 2. Random block system.

Treatment in previous year	Tobacco in 1931-32 Yields of green leaf per acre	Maize in 1933-34 Yields in lb. per acre
1. Tobacco unmanured ...	3,600 ...	2,860
2. Maize „ ...	4,673 ...	1,523
3. Soya bean „ ...	5,470 ...	2,660
4. Velvet bean „ ...	3,863 ...	2,343
5. Sunn hemp „ ...	6,043 ...	3,120

(cf. yields in same season in expt. above)

Due to	Degrees of freedom	Sum of squares	Mean square	$\frac{1}{2}$ log c
blocks ...	5 ...	1,416 ...	283.2	—
treatments ...	4 ...	21,389 ...	5,347.2	1.990
error ...	20 ...	12,660 ...	633.0	.923
Total ...	29 ...	35,465 ...	—	—

Z = 1.067 at the level of significance taken. Standard error = 61.6

Treatments ...	1	2	3	4	5	Mean	S.E.
Yields ...	709	316	657	567	776	605	61.6
% mean yield = 100	117.2	52.3	108.7	93.8	128.3	100	10.2

Criterion of significance = 30.6 %

The yield of maize following on a crop of sunnhemp is thus significantly greater than that obtained from the plots under a continuous rotation—tobacco-tobacco, maize-maize, and is also significantly greater than maize following on a crop of velvet beans, but is not significantly greater than maize following soya beans.

The yield of maize following the exhausting rotation above is also significantly less than the yield of maize following sunn hemp, soya bean, velvet bean and also the yield of maize following continuous tobacco which has received some fertilizer in past years.

It is evident that not only does soil exhaustion follow on continuous maize cultivation but the parasitic witchweed plays a part in the small yields obtained. It is also evident that the inclusion of leguminous crops in the rotation will assist in obtaining a reasonable yield of maize on these soils, even when those crops are harvested for seed and not dug in as green manure. It was thought, owing to the dryness of the season 1932-33, that the best results would be obtained by harvesting the leguminous seeds.

Referring again to the previous experiment with cattle manure, it will be seen that there is an increase in yield due to various treatments but that the difference in effect just fails to be significant. It can be said that the soil on the average plot in this experiment was initially fairly fertile and that an increase of the available plant food due to the various applications has not led to a large increase in yield on this soil and under the climatic conditions prevailing.

That the soils do not become rapidly exhausted is shown by the yields of tobacco and maize still obtained from a plot which was initially well supplied with organic matter but has not received any organic materials since it was opeued in 1926. The yield of maize is still over a ton to the acre in a good season such as 1934 and the yields as a whole give a useful criterion as to the effect of seasonal conditions.

Determinations of organic matter, of available plant food and of pH values of various plots on the station are frequently carried out, and it is hoped to have valuable data in course of time on the most economical applications of manures and of the time that they remain effective.

That mineral fertilizers are rarely required on these soils which are well managed as regards organic matter, rotations and anti-erosion measures has been well proved by various experiments.

Additional evidence is seen in the tables below.

Experiments with mineral fertilizers

Experiment I.^{3}K. Latin square.

	Crop 1932-33 Green gram lb. per $\frac{1}{8}$th acre.	Crop 1933-34 Finger millet lb. per $\frac{1}{8}$th acre
1. Nitrate of potash	93 ...	... 92
2. Wood ashes ...	103 ...	... 93
3. Muriate of potash	79 ...	... 108
4. Sulphate of potash	69 ...	... 115
5. Control ...	82 ...	... 110

It is at once apparent that these potassic fertilizers have had no influence on the yield obtained but that other factors were operative in determining the low yield.

Experiment I. P. Latin square

	Crop 1932-33 Finger millet lb. per $\frac{1}{10}$th acre	Crop 1933-34 Haricot bean
1. Control	291	... 78
2. Lime and double superphosphate	324	... 48
3. Lime	308	... 75
4. Double superphosphate ...	306	... 55

Here again the soil has not significantly responded to applications of mineral fertilizers such as lime and phosphates.

Lilongwe Experimental Station.

Work on the Lilongwe Experimental Station proceeded very satisfactorily during 1934 and many experiments have been laid down which should have far-reaching influence on the agriculture of the zone concerned. Many buildings were completed and the station at Likuni together with the sub-station at Chimvua can now be regarded as well equipped and capable of dealing with a wide variety of conditions. The soils at Chimvua in particular are typical of nearly all the important types in the Lilongwe and Dowa districts. Success was obtained in the scientific treatment of dambo soil and good growth was obtained with several crops new to the area.

Only one experiment with applications of different kinds of organic matter was highly significant, but this is to be expected with land which has but lately been cleared of woodland.

It is apparent that there is close co-operation between the officer in charge of the station, Captain R. M. Antill, M.C., and the supervisors of the Native Tobacco Board, and very useful work in the districts demonstrating the use of manures and ridge terraces is being carried out. The confidence of natives in the vicinity has obviously been obtained which augurs well for the assistance which should be available for their economic progress.

A. J. W. Hornby,
Assistant Director of Agriculture and Agricultural Chemist.

Appendix C

Notes on Experimental work at Port Herald.

This continues as formerly at the main mphala station and dimba sub-station. At the dimba station work on rice and maize proved a failure owing to the poor stands obtained.

The objects of the rice work are (1) to test the relative merits of the broadcast and local native methods of cultivation. Short-age and long-age varieties are included in the treatments under trial. This arrangement allows of (2) a time-of-planting trial under cotton. The latter crop is planted as each variety of rice matures, so providing a range of different planting dates. It is thought that the cultivation of a short-age rice with cotton to follow in the same season provides a very suitable system of double cropping in those dimba areas which are so flooded in most rainy seasons as to permit of rice growing only. If the rice can be got off the field in April, then cotton planted immediately should do well as the soil moisture reserves should be adequate in any year that the rice crop has proved a success.

The local varieties of Lower River rices are the subject of study and brief preliminary descriptions of them have been recorded during the year.

A series of ten varieties of pulses planted in April to follow maize gave yield results which suggested superiority in the cases of green gram (*Phaseolus mungo*) and two local varieties of cowpea (*Dolichos* spp.), namely *nseula* and *nkolomolowasalu*. The yields obtained from three .25 acre blocks gave calculated acre-yields of 400 lb., 408 lb., and 436 lb. respectively.

The dimba sub-station is now well established and a full programme of experimental work in connection with cotton, rice and the various native food crops grown under dimba conditions of mixed and double-cropping has been planned and duly commenced.

Save for small authorised modifications as an outcome of data obtained from trials, work at the main mphala station has proceeded according to its already established programme.

During the year a new combined implement and seed store has been erected. A total of five compost pits have been improved by the provision of brick revetments. The pit-silo has been made more permanent also by the addition of brick revetments.

The incidence of trypanosomiasis has been high and the herd has lost 3 work animals and one cow due to this disease. One other work animal had to be destroyed owing to the serious nature of the injuries it sustained when fighting with another animal. The remainder of the herd is healthy but the heavy loss of work animals is regarded with some apprehension.

It was seen that the influence of shade etc. produced by the *Cassia* trees which demarcate and intersect the experimental area tended to affect adversely results from crops grown in their proximity and in order that marginal influence on plots be reduced to a minimum a drastic reduction in their number has been made. It is expected that improvement will be seen almost at once as a result of the action taken.

The Empire Cotton Growing Corporation co-operates closely in the general cotton work undertaken by this department. This arrangement is of great value and advances considerably our mutual work of investigating the various cotton problems which exist. Seed-breeding is undertaken solely by the corporation's officials whose specialist knowledge in this particular branch of the work is their primary function. This year marks the advent of more uniform thought in respect of what is the most suitable time for planting of the crop. Different views had been held in the past. Influenced largely by the question of insect control the specialists of the corporation had favoured planting at a date considered to be too late if in the run of varying seasons optimum yields are to be aimed at. This applied particularly to non-flood lands.

Figures from the time-of-planting experiments conducted at this station since 1932 have given in each year significant results in favour of early planting. Incidentally it is considered reasonably safe to say that in general terms throughout Nyasaland early planting is safe and sound practice and that late planting is risky and unwise in the average run of years. It was noted from this season's figures that as the planting date advanced the incidence of stained cotton increased. Possibly this may be explained by the later fruiting season coinciding with a higher incidence of stainer attack.

The strain test results gave no figures of significance but yields which the twelve strains under trial gave were very similar.

Results obtained from the spacing trial tend to suggest in this season that value attaches to a spacing of 3 by 2 feet with 3 plants per hole. But the figures are not sufficiently significant to place a great deal of reliance upon this information.

It is only by seriously studying the various problems which exist that we can hope to further the cotton industry. By our experimental results obtained from the time-of-planting experiments we have been encouraged to advocate early planting as a general guiding principle for the native cultivator to adopt. As the experiment continues with the years further data will be accumulated and the value of any additional information will be passed on at once to the grower.

It is hoped that before long the experiments designed to test the relative merits of different plant spacings and plant populations will offer some reliable information which can be advanced to the mutual benefit of both grower and industry.

The average yield of seed cotton (all grades) for the mphala station was approximately 337 lb. per acre. At the dimba sub-station floods upset the cotton results appreciably. A few picked yield figures from both stations are included below.

Station	Field No.	Acreage	Planting date	Actual yield in lb. (all grades)	Calculated yield per acre lb. approx.
Mphala	11a	1	14 December	564.5	565
,,	14	2.5	11 ,,	1414.	566
Dimba	23e	.5	8 January	541.5	1083

It will be seen that even on the light soil of the mphala station excellent yields obtain to early planting. F. 23e. was planted in the ridge with kidney beans between. The yield from this ½-acre plot is quoted merely to indicate the possibilities of the dimba areas the sub-station represents.

In the mixed cropping systems it has been sufficiently established that cotton is a failure when interplanted with a long-age sorghum. The combination will be tried again, however, in order to ascertain how far the yield of cotton is affected when inter-cropped with a short-age sorghum. With regard to the general requirements of the native there can be little doubt that on mphala-land soils pearl millet and cotton go best together and maize and cotton in dimba areas.

It is unfortunate that the borer and fungus control trial (sorghum) again fell down. This was due on this occasion to the ravages of locusts in 1933 which resulted in our seed stock being insufficient for our requirements. Seed was procured locally but its germination powers were very poor and only thin indifferent stands were obtained on that account. The experiment will be proceeded with as in former years.

The system of rotations designed for the mphala station by Mr. Lawrence would appear to be very successful in the maintaining of soil fertility.

Compost manufacture at the station has been reasonably successful but a ready at hand supply of water is a difficulty. The main station is in urgent need of a new well to replace the present one which is dry during several months in the year.

F. Barker,
District Agricultural Officer.

Report of the Mycologist.

Tea Diseases.

Collar Scorch.—This disease usually affects six-month old seedlings in the nursery when the removal of the shades in December and January is too sudden. This year it was found affecting one-year old plants in a nursery in June, i.e., in the cold season.

Observations showed that only plants on the north side of each bed, which ran east and west, were affected. This indicated that the disease was a type of sun scorch as the sun is in the north at that time of year. An unusually hot dry May was the probable cause of the trouble.

The disease is at first recognisable as a darkened area of bark round the collar of the plant. This area later becomes sunken, forming a typical constriction. If the latter completely girdles the stem, the above-ground portions of the plant die back. Unless the plant sprouts from below the lesions, the root also dies back from the collar. If the lesion only partially girdles the stem, the plant may live until the time when it is transplanted, when, unless the conditions are exceptionally favourable, the diseased area spreads down the root and soon kills the plant.

It is interesting to note that *Rhizoctonia bataticola* is often present among other fungi isolated from the diseased areas. In this case this fungus is definitely only able to attack weakened tissues (sun-scorched bark at the ground level), the plants in the centre and south side of the nursery beds not being attacked. Here also is a case where this fungus must have entered via a route other than through the finer rootlets as the area attacked is often devoid of rootlets. This together with other observations on *R. bataticola* tends to show that under Nyasaland conditions this fungus can only be considered capable of attacking woody plants under specialized conditions. The commonest strain of this fungus in Nyasaland is a member of Haigh's C group. Experiments are being carried out to test the parasitism of this strain on tea plants from the age of seedlings upwards.

Flush Scorch.—One estate undoubtedly lost a considerable crop in November due to a peculiar scorching of the young flush. This was characterized by a brown discolouration of the leaf bases, petioles and stems and also by brown lines in the leaf lamina corresponding to the original folds of the leaf when unfolding from the bud. All the discoloured areas became russetted during later growth. No organism was isolated from the tissues. This disease seems also to be due to some anomalous climatic condition. The year 1934 had an unusually heavy rainfall in June which may have forced the tea and thereby rendered it susceptible to sun scorch in October. At the onset of the rains the flush was held back, but once new growth had been made the affected bushes grew away from the disease and there was no further evidence of it.

Other Diseases.

Coffee Bark Disease.—A disease of old coffee was found for the first time in 1934. The symptoms of the disease are similar in many respects to the bark disease of coffee in East Africa described by Storey in *Ann. Appl. Biol. Vol. XIX, 1932.* The disease is apparently caused by a species of *Fusarium* similar to, if not identical with, *F. lateritium* which was shown by Storey to be the cause of the East African disease. The symptoms of the disease described by Storey and those of the disease in Nyasaland differ mainly in that in the former case the disease is confined to attack on suckers which shoot from cut-back bushes, while in Nyasaland the primary branches of the original stems are affected.

The primary branches look sickly and die suddenly with their leaves attached. A constriction at the base of the primary is the characteristic symptom of the disease. There is usually a shrunken area on the main stem round the base of the affected primary. Scraping the bark at the affected area shows a brown discolouration of the bark in place of the normal healthy green cortex. The occurrence of these necrotic lesions at the base of many primaries on one stem has the effect of partially ringing that stem and the whole plant suffers in consequence.

As it is the primaries which are affected there is no remedy for an affected bush except to cut back the main stem to a point below the lowest affected primary and allow a sucker to grow up. This method, however, is handicapped by the disease appearing in its East African form, namely, attacking the new suckers at their junction with the parent stem. It will probably be found that digging out and replanting will be the best method of dealing with the disease because, so far, the disease has only been found to attack old coffee trees and the suckers shooting from them after being cut back.

Mango.—(*a*) *Stem canker.* This takes the form of oblong-ovate lesions which are at first yellow-brown in colour and appear sunken in the stems of the young flush. These lesions later on either remain as slightly swollen yellow-brown lesions on the green stem or else they become blackened by the invasion of the original lesion by fungi and bacteria. The lesions do not spread up or down the branches.

(*b*) *Angular leaf spot.* Numerous sharply defined brown to black spots, 1 to 4 mm. in diameter, are situated between the veins of the leaf. This gives them their angular shape. Lesions on the petiole and midrib of the leaf are oblong in shape.

(*c*) *Fruit scab.* This occurs as hard black scabs, 2 to 5 mm. in diameter, scattered over the surface of the fruit. Each scab is surrounded by a slightly sunken ring of cork tissue which may reach a breadth of 5 mm.

(*d*) *Fruit rot.* This usually affects the youngest fruit but it may affect half-grown fruit. It is characterized by a gradual rotting of the skin. Internally a small hollow rotted cavity, 0.5 to 1 cm. in diameter, extends often as far as the seed. The latter may be discoloured. The fruit usually falls prematurely, but, if it remains on the tree, the smaller fruits look like raisins while the larger fruits are shrivelled and are russet-brown to copper in colour.

These diseases have symptoms which are very similar to diseases caused by fungi and bacteria. Investigations have shown, however, that they are caused by the capsid bug (*Helopeltis bergrothi* Reut.) best known in Nyasaland as the Tea Mosquito Bug. The interest of this work together with that of Smee and Leach (*Dept. Agric. Nyasaland Bull. No. 5, 1932*) on gnarled stem canker of tea is that it shows that insects can produce diseases in plants which can be mistaken readily for fungus and bacterial disease, as is the case with the avocado fruit scab described below.

Avocado Fruit Scab.— Before the mango fruit scab was shown to be due to the feeding of *Helopeltis bergrothi*, this scab of avocado was thought to be due to a fungus or bacterium. In 1933 spraying with Bordeaux mixture was considered a feasible method of trying to control the disease until the latter was correctly diagnosed. The scabs found on the young fruits in December 1934 were realised to be similar in shape and structure to those of the mango fruit. This led to the discovery that the avocado fruit scab was caused by the same insect.

Control measures for this and the mango diseases must aim at preventing attack by *H.bergrothi*. Smee (*Dept. Agric. Nyasaland Ento. Ser. Bull. No. 4*) has suggested control measures for this insect on tea in this country. I am indebted to him for assistance during the work on mangoes and avocadoes.

Tea Seed Storage and Germination

Seed Storage.— A series of experiments in the laboratory again showed that tea seed keeps best in air-tight tins when dried to a loss of five per cent of its weight from the ripe capsule. This storage is accomplished with ease when using small quantities of seed, but the application of the laboratory results to storage on an estate scale is by no means so easy.

The one great difficulty encountered is that the water given off during respiration of the seed condenses on the sides of the air-tight storage receptacle. In small quantities of seed kept in cigarette tins there is only a small amount of water given off and it is absorbed by rusting the sides of the tins, thereby freeing the seed from contact with the condensed water. In large quantities of seed such as might be stored in tea chests, the amount of water given off is considerable. This condenses on the sides of the chests and the seeds next to the sides and especially next to the bottoms of the chests come into contact with a considerable quantity of condensed water. This inevitably leads to rotting of those seeds. More water is given off during putrefaction of the seed and in a short time (one month) the entire bulk of seed may be completely rotten.

A method will have to be found to prevent the seed from coming into contact with the free water. Experiments show that there are three possible methods which will be tested out again in 1935. One method is to store the seed in sealed tea boxes together with charcoal. This at first appeared to be the solution, but it was found that by using a large proportion of charcoal the seeds dried out too much owing to the strong attraction for water which charcoal possesses. There will have to be a minimum and maximum ratio of charcoal to seed worked out for packing in this way. The second method which appears to give most promise is to pack the seed at the optimum moisture content in such a manner that there is an air space between the seed and the sides of the box or tin in which it is to be stored. The third method is to keep the seed mixed with sand in pits dug in the soil. The sand should be kept covered with cut grass which should be sprinkled with water at certain periods in order to prevent the seed from drying out. The water given off by the seed is absorbed by the soil on the sides and bottom of the pits. This method was discovered by Mr. R. C. MacGrath, Manager of Bandanga Estate, Cholo. He stored over a ton of seed in this way. Although he kept his seed with no more than a shade of silky oak seedling plants growing between his sand pits, it will undoubtedly be safer and necessary to carry out this method of storage under more controlled conditions, i.e., under a roof, so that the amount of watering of the seed can be controlled and so that the seed will not germinate with the first rains.

Seed Germination.— During the work on tea seed storage some interesting data were collected on seed germination. Collecting the seed off the trees, testing for floaters and drying in the sun for one day increases the rate of germination by aproximately double in the first month in the germinating pit without causing any damage to the seed. A similar rise in the germination rate occurs in the second month. If the seed is dried in the sun for two days, the rate of germination may be increased to 70 per cent in the first month but 25 per cent of the whole bulk may be killed. The optimum degree of drying for increased germination is minus 15 per cent of the original fresh weight of the seed when taken out of the capsule. A day in the sun in April or May (the time when most of the Mlanje Indian-jat seed is ripening) will dry the seed out no further than 15 per cent if the seed is not put out to dry until 9 a.m. The death of seeds caused by drying in the sun for two days shows how dangerous is the method of picking the seed off the ground; although the seeds are shaded by the foliage of the parent trees, if they are left on the ground for more than two days they run a big risk of being killed.

Gadd in Ceylon (*Tea Res. Inst. Bull. No. 3, 1928*) found that mechanical cracking of the seed increased the rate of germination in much the same way as the above results. Experiments in Nyasaland show that the cause of the increased germination is the cracking of the hard testa during the drying process. Drying the seed in the shade does not cause such pronounced cracking and it was found that the rate of germination is not so rapid.

It has been found that the rate of germination of stored seed increases during storage of the seed. The rate of germination of the seed before storage was 24 per cent in the first month in the germinating pit, while after six months' storage the germination was 86 per cent in the first month. This agrees with Harrison's results published in his work on seed storage (*Indian Tea Assoc. Quart. Journ. 1926*).

Twisted Tap Roots.—A study of the growth of tea seedlings in the nursery was started to examine the reasons for the formation of twisted tap roots, the number of which has been found to be appreciable in many nurseries. Some interesting data are being collected and will become available by the end of 1935.

Mlanje Experimental Station.

Planting.—All the land opened in 1933 was planted up with $1\frac{1}{2}$-year old Mlanje Indian-jat stumps. Owing to many spells of hot dry weather during the planting season the resulting stand of plants was very disappointing. The climatic conditions of Nyasaland are such that however carefully planting is carried out it is impossible to predict the onset of a spell of a fortnight's hot sunny weather immediately afterwards. An experiment has been started to test out different methods of planting to get over this difficulty.

Soil Erosion Strip Plots.—An experiment was laid out on much the same lines as that described in Ceylon (*Tropical Agriculturist Vol. LXXX, No. 4, 1933*). Six cement pits have been built at the foot of six strip plots which measure 77 ft. in length and 14 ft. in breadth. The fall chosen is 1 in 20 instead of 1 in 2 as chosen in Ceylon.

The treatments given to the plots are (1) *Cajanus indicus* (*nandolo* or pigeon pea) close planted in alternate rows at right angles to the slope of the land, (2) a local *Sesbania* sp. planted in the same way as *C. indicus*, (3) *Indigofera endecaphylla* planted as strips in alternate rows similar to *C. indicus*, (4) Indore compost dug in at the rate of 10 tons per acre, (5) *Alternanthera* sp. planted as cuttings close together on the 2 ft. contour lines, (6) no treatment as a control. The soil washed off the strip plots will be collected in the cement pits and will be measured at the end of each season.

The *Alternanthera* sp. is commonly grown as a border for garden beds. It has been found to hold up soil wash very effectively. It can be readily established and distributed over a large area in a short time. Although it is not leguminous, it may prove to be a useful plant to use for anti-erosive purposes. It has little lateral root spread and can be easily controlled above ground.

Uniformity Trials for Yield.—Uniformity trials were made in March on the experimental plots in the old local-jat tea on Ruo Estate where three experiments have been started in the 1934-35 season.

(i) Different pruning methods over one pruning cycle of six or seven years.

(ii) Different fertilizer treatments over a period of five years.

(iii) Different degrees of intensity of plucking to be carried out for two years on clean-pruned tea and then for two years on cut-across tea.

The uniformity trials were carried out to test whether there was any significant difference between the plots assigned to the different treatments before the latter were actually applied.

R. Leach,
Mycologist

Notes on Plant Introductions.

By the Assistant Director of Agriculture.

These may be divided into (*a*) new varieties of food crops, (*b*) citrus and other fruit trees, (*c*) shade and cover plants, (*d*) oilseeds and essential oil plants, and (*e*) miscellaneous fodder, grass, insecticide and fibre plants.

Class.

(*c*) *Acacia decurrens.* This type of wattle is doing well in Zomba and Cholo. It may be useful as a medium shade tree, but it is early yet to say whether it will be a useful timber tree or as a source of wattle.

(*c*) *Albizzia odoratissima* gives quite vigorous growth as a shade tree in the early stages and is easy to establish.

(*d*) *Aleurites* spp. (Tung oil). Seed of varieties from special trees growing in China and Florida was obtained and trees are now under trial. The much greater success with *montana* on the Zomba Experimental Station is to be noted.

(*e*) *Aloe* spp. Various ornamental species of *Aloe* such as *arborescens, nitens, succotrina, saponaria, greenii, zebrina* have been added to the collection in the Botanic Gardens.

(*e*) *Artemisia brevifolia* var. *maritima* grows well as a source of santonin. It is difficult to raise from seedlings in the nursery which is a disadvantage for large-scale culture.

(*d*) *Bassia latifolia* is growing well in the early stages.

(*e*) *Cactus* spp. Spineless cactus varieties were obtained from South Africa but so far only one has been successful.

(*e*) *Caesalpinia spinosa.* Tara bean grows well but is a very shy seeder. The seed has value commercially as a source of tannin.

(*b*) Cashew nuts have been grown in nurseries and have shewn the usual promise on planting out, especially at lower elevations.

(*d*) Castor oil seed of several varieties has been planted, and a report on the seeds has been obtained from the Imperial Institute. Concentration will be made on the best varieties.

(*e*) *Ceiba pentandra* seed which had been taken from selected trees was kindly sent by the Director of the Buitenzorg Experimental Station, Java, and has now given trees which are growing well in the Botanic Gardens.

(*b*) *Citrus* spp. As recommended by Prof. Clark Powell and Mr. Pickstone, the following were obtained for trial under a variety of conditions.

(*a*) Oranges: Mediterranean Sweet, Chipoli Beauty, Jaffa, Premier, Valencia Late, Washington Navel, Bergamot.

(*b*) Grape Fruit: Triumph

(*c*) Tangerine or Naartje: Emperor, Dancy, Cape.

(*d*) Lemon: Eureka, Villa Franca.

(*e*) *Cynodon* spp. Fine varieties of Bermuda or dub grass such as Magennis and Royal Cape are doing well.

(*c*) *Clitoria laurifolia* as a hedge plant and medium shade is doing well.

(*c*) *Derris microphylla* as a medium shade plant shows distinct promise.

(*d*) *Elaeis guineensis.* Selected West African oil palm plants are likely to be more of a curiosity in the Botanic Gardens than to have commercial value.

(*c*) *Enterolobium saman* and *Erythrina velutina* may be of value as shade trees.

(*d*) Groundnuts. Senegal and Gambia varieties have been tried with so far little success.

(*c*) *Leucaena glauca* shows some promise not only as a cover but as a minor fodder crop.

(*a*) Maize. The Anvelt variety has been obtained from South Africa but it is early yet to estimate its value for yield and early maturity.

(*e*) Manila hemp is growing fairly well in Zomba.

(*a*) Millets of various kinds have been introduced but the only one here worth mentioning is Italian white proso which is in much greater demand as birdseed than other proso or foxtail millets. The other varieties are hardly superior to local types.

(*a*) Oats. Varieties such as Sunrise, Kherson hull-less have been obtained from Southern Rhodesia and are quite good as a winter crop. Whether they are superior types to the local Nyasa is a subject for experiment.

(*b*) Olive trees kindly given by Dr. Conforzi are being tried in various parts of the country.

(*d*) *Pelargonium* spp. are under trial; at present no conclusions are possible. The same applies to

(*e*) Pyrethrum (*Chrysanthemum cinerariaefolium*) in several types.

(*b*) *Psidium cattleianum* (Strawberry guava) has been introduced and is growing well.

(*c*) *Sesbania sesban* is growing well as a contour hedge and light shade but is rather slow in early growth.

(*a*) Soya bean varieties. Otaxi, Yellow Mammoth and Barberton Yellow show distinct promise, especially as non-shattering types.

(*a*) Sugar cane varieties of the following designations have been imported from Natal and some are likely to be much superior to types now locally grown. CO 281 and 290, POJ 2714, 2727, 2803, 2822, 2946, 2947, 2952, 2725, 2878, CH 64/21.

(*d*) Sunflower. White sunflower has grown well on the Zomba Experimental Station and good seed heads have been selected.

(*a*) Sweet potatoes. The two superior varieties Linslade and Early Butter were obtained from Southern Rhodesia and are doing very well.

(*d*) *Vetiveria zizanioides* grows very well and is quickly reproduced vegetatively. It may be not only a source of essential oil but also of great use for planting up on old land in contour lines to minimise erosion and assist in renovation.

(*b*) Vines. Barbarossa, Alphonse Lavalle, Red Muscatel and other varieties kindly given by Dr. I. Conforzi are showing distinct promise. Fungus disease and insect pests require careful control.

(*a*) Wheat varieties. Quality, Reward, Garnet and Lalkassar are very superior to local types and are worthy of extended culture and proper tests.

(*e*) Woolly finger grass. Varieties of *Digitaria Penzii* from South Africa and Southern Rhodesia are undergoing trial as fodder grasses.

(*a*) Yams. A collection of local yams and species from the Royal Botanic Gardens, Kew, is being studied.

EUROPEAN AGRICULTURE.

Name of district.	Total acreage under cultivation. Acres.	Tobacco. Total. Acres under crop.	Tobacco. Total. Yield cwt.	Tobacco. *Fire-cured.* Acres under crop.	Tobacco. *Fire-cured.* Yield cwt.	Tobacco. *Flue-cured.* Acres under crop	Tobacco. *Flue-cured.* Yield cwt.	Tobacco. *Air-cured.* Acres under crop.	Tobacco. *Air-cured.* Yield cwt.	Tea. Acres under crop.	Tea. Yield cwt.	Coffee. Acres under crop.	Coffee. Yield cwt.
Lower Shire	80	...	...	...	...	...	...	...	...	...	...	...	...
Chikwawa	452	95	868	...	...	*95*	*868*	...	..	...	...	7	30
Central Shire ...	485	380	1,263	...	.	*180*	*510*	*200*	*753*	...	...	...	...
Cholo	14,687	1,818	7,169	*268*	*1,117*	*1,550*	*6,052*	...	...	6,856	4,486	416	328
Mlanje	12,817	773	3,315	*245*	*976*	*413*	*1,673*	*115*	*666*	8,558	35,240	157	165
Blantyre	5,412	1,098	5,275	*163*	*508*	*860*	*4,487*	*75*	*280*	...	...	314	278
Chiradzulu	1,860	56	181	*15*	*40*	*41*	*141*	...	...	...	..	.	...
Zomba	2,370	550	2,825	..	...	*533*	*2,773*	*17*	*52*	...	...	...	...
Upper Shire	188	96	408	*85*	*355*	*4*	*16*	*7*	*37*	...	...	...	...
South Nyasa	1,694	1,085	4,564	.	..	*1,065*	*4,489*	*20*	*75*	...	...	37	...
Ncheu	1,752	1,336	5,239	*595*	*3,222*	*486*	*1,419*	*155*	*598*	...	...	35	40
Dedza	446	201	392		...	*166*	*285*	*35*	*107*	...	...	10	14
Fort Manning ...	187	114	430	...	...	*53*	*202*	*61*	*228*	...	...	...	...
Lilongwe	1,752	658	2,693	*308*	*1,501*	*238*	*904*	*112*	*288*	...	...	...	...
Dowa	1,757	90	156	*50*	*75*	...	...	*40*	*81*	...	...	...	...
Kota Kota	24	...	...	...	...	...	...	...	..	...	...	...	...
Kasungu	35	...	...	...	...	...	...	...	...	...	...	...	...
Mombera	177	...	...	...	...	...	...	...	...	...	...	142	62
West Nyasa	1,315	...	...	...	..	...	...	...	...	...	...	...	..
North Nyasa	162	...	...	...	...	...	...	...	...	...	...	70	122
Total ...	47,652	8,350	34,778	*1,829*	*7,794*	*5,684*	*23,819*	*837*	*3,165*	15,414	39,726	1,188	1,039

NOTE:—TEA: Acreage in plucking 1934 was 11,265. COFFEE: Acreage in bearing 1934 was 805.

EUROPEAN AGRICULTURE—CONTINUED.

Name of district	Sisal. Acres under crop.	Sisal. Yield cwt.	Cotton. Acres under crop.	Cotton. Yield cwt. (lint)	Rubber. Acres under crop.	Rubber. Yield cwt.	Chillies and Capsicums. Acres under crop.	Chillies and Capsicums. Yield cwt.	Maize. Acres under crop.	Maize. Yield cwt.	Wheat. Acres under crop.	Wheat. Yield cwt.
Lower Shire	...	...	45	54	...	..	..	...	5	8	...	...
Chikwawa	...	...	115	289	...	...	...	...	115	222		..
Central Shire	...	...	...	...	...	...	...	...	...	...	...	...
Cholo	...	..	.	....	....	...	...	...	264	3,366	30	102
Mlanje	...		7	18	...	...	135	224	311	4,568	..	.
Blantyre	..	...	54	98	...	...	4	8	187	2,354	5	5
Chiradzulu	..	...	40	200	...	...	...	...	30	300	...	...
Zomba	...	...	28	34	...	...	...	...	157	3,510	1	1
Upper Shire	...	...	...	...	...	...	...	...	28	307	...	...
South Nyasa	...	...	...	...	...	...	...	...	75	252	...	...
Ncheu	...	...	120	219	...	...	...		66	880	...	...
Dedza	...	...	10	15	...	.	24	20	35	72	15	84
Fort Manning	...	...	...	...	...	...	..	...	...	...	15	...
Lilongwe	...	...	11	6	...	...	2	13	87	1,562	...	...
Dowa	...	...	1,070	1,517	...	...	...	...	30	660	...	...
Kota Kota	.	...	...	...	...	...	...	...	...	...	2	25
Kasungu	...	...	...	..	...	...	...	...	15	62	...	...
Mombera	.	...	...	...	...	...	...	...	5	82	1	11
West Nyasa	...	...	.		1,300	...	...	...	...	...	...	...
North Nyasa	...		1	1	...	...	...	...	45	514	1	3
Total ...	...	...	1,501	2,451	1,300	...	165	265	1,455	18,719	70	231

EUROPEAN AGRICULTURE—CONTINUED.

Name of district.	Legumes.							Oil Seeds.					
	Total.		*For food.*		*For fodder*		*For green ma'ng.*	Total.		*For crushing.*		*For food.*	
	Acres under crop.	Yield cwt.	*Acres under crop.*	*Yield cwt*	*Acres under crop.*	*Yield cwt.*	*Acres under crop.*	Acres under crop.	Yield cwt.	*Acres under crop.*	*Yield cwt.*	*Acres under crop.*	*Yield cwt.*
Lower Shire	15	28	*15*	*28*	...	...	...	6	33	...	...	*6*	*33*
Chikwawa	21	2	*1*	*2*	...	...	*20*	...	...	...	...	...	...
Central Shire	55	18	*15*	*18*	...	...	*40*	...	...	...	...	...	...
Cholo	577	414	*79*	*54*	*28*	*360*	*470*	33	289	*4*	*30*	*29*	*259*
Mlanje	1,516	852	*294*	*686*	*53*	*166*	*1,169*	...	...	...	...	...	...
Blantyre	310	882	*27*	*202*	*57*	*680*	*226*	10	122	...	...	*10*	*122*
Chiradzulu	155	200	*25*	*200*	...	...	*130*	...	...	...	...	...	...
Zomba	370	532	*111*	*485*	*51*	*47*	*208*	22	73	*5*	*20*	*17*	*53*
Upper Shire ...	38	12	*12*	*12*	*1*	...	*25*	2	10	...	...	*2*	*10*
South Nyasa	53	...	...	...	...	...	*53*	6	...	...	...	*6*	...
Ncheu	78	...	*11*	...	...	...	*67*	9	14	...	...	*9*	*14*
Dedza	17	7	*11*	*7*	...	...	*6*	2	...	...	...	*2*	...
Fort Manning	6	...	*6*	...	...	...	...	...	...	...	...	...	...
Lilongwe	322	38	*10*	*38*	...	...	*312*	1	8	...	...	*1*	*8*
Dowa	205	20	*5*	*20*	...	...	*200*	5	67	...	...	*5*	*67*
Kota Kota	...	...	...	...	...	...	...	...	...	...	...	...	...
Kasungu	2	45	*2*	*45*	...	...	...	...	...	...	...	...	...
Mombera	...	...	...	...	...	...	...	...	...	...	...	...	...
West Nyasa	5	60	*5*	*60*	...	...	..	3	20	...	...	*3*	*20*
North Nyasa	7	35	*7*	*35*	...	...	...	...	...	...	...	...	...
Total ...	3,752	3,145	*636*	*1,892*	*190*	*1,253*	*2,926*	99	636	9	*50*	*90*	*586*

EUROPEAN AGRICULTURE—CONTINUED.

Name of district.	Tung Oil.		Fruit Trees.		Nut-Bearing Trees.		Miscellaneous.		Woodland Artificially Established.
	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres.
Lower Shire	...	...	3	20	...	...	...	...	6
Chikwawa	...	...	46	...	...	...	...	...	53
Central Shire	...	...	...	...	...	...	...	...	50
Cholo	106	...	116	3	2	...	...	...	4,469
Mlanje	72	...	98	94	...	...	10	34	1,180
Blantyre	3	...	11	...	...	...	5	400	3,411
Chiradzulu	...	...	3	1	...	...	...	...	1,576
Zomba	2	...	6	20	...	...	...	...	1,234
Upper Shire	...	...	3	2	...	...	...	...	21
South Nyasa	...	...	2	2	...	...	...	...	436
Ncheu	...	...	8	10	...	...	...	...	100
Dedza	...	...	23	142	...	...	...	...	109
Fort Manning	...	...	8	...	...	...	...	...	44
Lilongwe	1	...	6	70	...	...	...	...	664
Dowa	...	...	10	2	...	...	...	...	347
Kota Kota	...	...	2	10	...	...	...	...	20
Kasungu	...	...	...	...	...	...	...	...	18
Mombera	..	...	...	...	...	...	...	...	29
West Nyasa	...	...	2	...	...	...	...	...	5
North Nyasa	...	...	2	...	...	...	...	...	36
Total ...	184	...	349	376	2	...	15	434	13,808

NATIVE AGRICULTURE.

District.	Seed Cotton	Rice	Wheat	Ground-nuts	Tobacco	Maize	Peas and Beans
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Lower Shire ...	2,879						
Chikwawa ...	2,074				...		
Central Shire ...	132				...		
Cholo ..	...				23		
Mlanje ...	63				582		
Blantyre ...	31				255		
Chiradzulu ...	...				790		
Zomba ...	1				471		
Upper Shire ...	4				19		
South Nyasa ...	...				...		
Ncheu ...	22				148		
Dedza ...	33				119		
Fort Manning ...	...				183		
Lilongwe ...	...				1,717		
Dowa ...	120				747		
Kota Kota ..	...				...		
Kasungu .	...				...		
Mombera ...	...				...		
West Nyasa ...	...				...		
North Nyasa ...	27				...		
Total	5,377				5,054		

NOTE.—Maize is the staple foodstuff in most districts; groundnuts, rice, wheat, beans and various other crops are also grown by natives for local consumption, but it is impossible to make an accurate estimate of the quantities of any of these crops.

The above tobacco and cotton figures represent the quantities purchased in each district, and do not accurately reflect the production by districts, as many natives grow their tobacco and cotton in one district and sell in another.

NATIVE LIVE STOCK.

District.	Cattle.	Sheep.	Goats.	Pigs.
Lower Shire	101	1,602	9,380	3,310
Chikwawa ...	177	1,385	7,204	2,023
Central Shire	1,070	1,459	5,255	2,558
Cholo	144	907	5,768	4,271
Mlanje	531	4,556	12,338	12,986
Blantyre	1,347	1,152	6,217	6,185
Chiradzulo	1,947	923	8,545	3,751
Zomba	944	682	1,371	178
Upper Shire	*72	*3,078	*7,339	*559
South Nyasa	506	5,421	7,231	119
Ncheu	16,215	*4,500	*27,500	*6,500
Dedza	*20,375	*17,088	*29,767	*10,423
Fort Manning	1,330	3,380	8,585	3,939
Lilongwe	39,200	7,000	51,000	3,700
Dowa	17,740	7,663	36,277	4,776
Kota Kota	2,869	2,520	11,242	2,397
Kasungu	1,986	3,065	2,026	57
Mombera	*41,445	*8,802	*18,370	*13
West Nyasa ...	1,802	68	703	—
North Nyasa	31,840	*323	*1,788	—
Total	181,641	75,574	257,906	67,745

*1933 figures; 1934 figures not available.

LIVE STOCK OWNED BY EUROPEANS AT 31ST DECEMBER, 1934.

District.	Cows and heifers.	Bulls.	Oxen.	Calves.	Pedigree cattle.	Horses.	Mules.	Donkeys.	Sheep.	Goats.	Pigs
Lower Shire	1,233	18	356	390	1	...	...	...	173	52	127
Chikwawa	265	7	19	219	...	...	...	16	...	...	...
Central Shire	23	2	24	13	...	...	...	2	...	...	...
Cholo	1,325	44	922	726	9	...	...	34	333	16	108
Mlanje	1,317	30	886	515	3	...	...	5	274	47	166
Blantyre	1,434	27	890	820	27	2	...	11	1	...	166
Chiradzulo	754	10	326	377	13	1	...	4	40	...	75
Zomba	1,141	23	989	400	6	1	...	29	197	...	83
Upper Shire	11	1	2	5	...	...	...	...	25	117	33
South Nyasa	32	4	26	19	...	...	...	...	33	114	...
Ncheu	251	8	194	110	1	...	...	4	56	10	100
Dedza	312	32	595	298	9	...	...	69	289	72	201
Fort Manning	66	3	78	31	...	...	...	..	50	...	12
Lilongwe	218	13	180	81	...	...	...	17	76	17	142
Dowa	12	...	13	5	...	...	...	2	70	30	7
Kota Kota	43	1	16	13	...	...	...	5	58	5	5
Kasungu	...	...	...	...	...	...	...	...	7	...	5
Mombera	20	2	29	9	...	...	...	6	25	...	36
West Nyasa	13	2	10	6	..	...	...	...	...	...	30
North Nyasa	127	5	114	53	...	...	...	...	83	...	45
Total ...	8,597	232	5,669	4,090	69	4	...	204	1,790	480	1,341

Native Tobacco Board.

STATEMENT OF RECEIPTS AND PAYMENTS, 1934.

RECEIPTS			PAYMENTS			
Balance brought forward from 1933		£12,852 6 9	*Personal Emoluments*			
Revenue 1934			*European Staff*			
Tobacco Tax	10,229 4 0		Secretary	£50 0 0		
Sale of tobacco seed to Natives	1,463 9 0		Agent and Senior Supervisor	650 0 0		
Sale of tobacco seed to Europeans	36 15 0		Agricultural Superintendent	550 0 0		
Sale of miscellaneous seeds and plants	16 0 9		Supervisors, 10 @ £400	3,406 12 4		
Miscellaneous receipts	15 8		Clerk	300 0 0		
Sale of tobacco booklets	16 15 5		Supervisors, temporary, 4 from Oct/Nov. to Dec. @ £360	255 1 4		
Interest on fixed deposit	190 0 0		Acting allowance	8 18 7	£5,220 12 3	
Total Revenue		11,952 19 10	*Native Staff*			
Advances Returned		260 13 1	14 Clerks, rates and periods variable, £3 to £15	46 7 0		
Balance due to Treasury		288 11 10	163 Capitaos, rates and periods variable, £9 to £18	1,619 7 4		
			11 Watchmen, rates and periods variable, £4 16 to £5 2s.	38 5 6		
			Messengers	1 4 6	1,705 4 4	
			Total Personal Emoluments			£6,925 16 7
			Other Charges			
			Travelling		1,036 18 11	
			Passages		344 9 4	
			Mtiti Seed Plot		41 9 9	
			Experimental Plots (Capitaos)		16 8 0	
			Lilongwe Experimental Station		228 7 3	
			Buildings (*a*) Repairs to Agent's House		25 18 1	
			(*b*) Rebuilding Agent's Store		79 18 3	
			(*c*) House at Lilongwe for Clerk		4 10	
			Furniture for Clerk's House		16 15 9	
			Stationery and Printing		64 6 11	
			Implements and Equipment		34 4 9	
			Typewriter		3 6	
			Tents		45 19 10	
			Incidentals		27 6 7	
			Total Other Charges			1,962 11 9
			Contributions			
			Roads		10 0 0	
			Zomba Experimental Station		298 1 7	
			Nyasaland Government—Clerical Assistance		189 15 0	
			Total Contributions			497 16 7
			Central Buying Stations			
			Permanent station hands		18 10 8	
			Erection and enlargement of		51 11 10	
			Sanitation		9 5 3	
			Total Central Buying Stations			79 7 9
			Total Expenditure			9,465 12 8
			Advances Made			516 14 7
			Balances carried forward to 1935			
			Current account at Bank		8,372 4 3	
			Fixed Deposits at Bank		7,000 0 0	15,372 4 3
		£25,354 11 6				£ 25,354 11 6